



FRIDAY, SEPTEMBER 21, 1900.

CONTENTS

ILLUSTRATED:

A Melan Arch Bridge..... 617

Details of Class "D" Passenger Locomotives of the Chicago & Northwestern..... 618

A Heavy Cut-Off Saw..... 621

CONTRIBUTIONS:

Long Tubes for Locomotive Boilers..... 615

EDITORIAL:

The Effect of Temperature on Friction..... 624

Annual Reports—Illinois Central; Chesapeake & Ohio; New York, Ontario & Western..... 624

Injunctions Against Trades Unions in England..... 625

Editorial Notes..... 624, 625

MISCELLANEOUS:

The Railway Signaling Club..... 615

The Traveling Engineers' Association..... 616

Education of Railroad Men for Maintenance of Way..... 619

Master Car Painters' Annual Convention..... 620

Eastern Maintenance of Way Association Meeting..... 620

Some of the Awards at Paris..... 621

The Fastest Trains in the World in 1899..... 623

Naval Architecture at the University of Michigan..... 624

GENERAL NEWS:

Technical..... 624

The Scrap Heap..... 625

Locomotive Building..... 626

Car Building..... 626

Bridge Building..... 627

Meetings and Announcements..... 627

Personal..... 627

Elections and Appointments..... 627

Railroad Construction..... 628

General Railroad News..... 628

Contributions

Long Tubes for Locomotive Boilers.

53 Broadway, New York,)
Sept. 12, 1900.)

TO THE EDITOR OF THE RAILROAD GAZETTE.

At the June meeting of the American Railway Master Mechanics' Association there was a topical discussion on the length of locomotive boiler tubes; the question being as to whether they had reached their limit of length. The position was taken that they had not, and that it was quite possible to use tubes 20 ft. long without experiencing any difficulty due to variations in expansion between the tubes and the shell, or from leakage caused by vibrations. It was hinted, at the time, that possibly there might be no gain in the steaming capacity of the boiler from an addition to the length of the tubes, and certain French experiments were referred to as pointing in that direction.

As the question is one of great importance to railroad companies, in view of the constantly increasing demand upon the steaming capacity of the boiler, it may be well to make a brief review of the state of the art and give a short summary of available data on the subject.

The subject is certainly a complex one, and is so filled with variables that it seems all but impossible to formulate any hard and fast rule for the proportioning of the length of tubes and least of all to state that some one particular length is the most economical and efficient.

The value of the tube depends upon the relative area of the tube sections to that of the grate; the amount of fuel burned per unit of time, the vacuum in the smoke-box, the pressure of the steam, the length of the tubes, the temperature of the feed-water, and the point at which it is introduced into the boiler.

With such a state of affairs it is evident that varying results will be obtained with each and every boiler, but it may, nevertheless, be possible to ascertain that it will not be economical to lengthen the tubes beyond certain prescribed dimensions for certain classes of service.

Take for example an engine running under normal conditions: If the rate of combustion is increased the smoke-box temperature rises and the evaporative efficiency of the tubes falls. If these are increasing in length to meet this emergency the vacuum fails to maintain the draft and the rate of combustion drops. If the vacuum is raised by decreasing the area of the exhaust nozzle, there is an increase of back pressure on the piston involving an increased steam consumption to perform the given amount of work. This puts an increased demand upon the boiler and the efficiency gained by the increase in the length of the tubes may be more than neutralized by the greater waste in the cylinders. Just where the nice adjustment of balance occurs that a variation of tube length in either direction means an increased consumption of coal for the work to be done is a problem of no mean proportions. Two valuable contributions have been made to the subject: The first consists of the experiments of M. A. Henry, the engineer of rolling stock and motive power of the Paris, Lyons & Mediterranean R. R., who conducted an elaborate series of experiments something more than ten years ago to ascertain the most economical length of tube to be used. His results were printed by abstract in the *Railroad Gazette* of July 4, 1890, which abstract gives a sufficiently complete and correct summing up of M. Henry's observations and conclusions for the use of those to whom the original French report is not available.

The second of these contributions is the experiments of

Prof. Goss at Purdue University on the effects of high rates of combustion upon the efficiency of locomotive boilers and contained in the Proceedings of the New York Railroad Club for September, 1896.

The unfortunate part of these two sets of experiments lies in the fact that neither touched upon the territory of the other. M. Henry worked with low vacuums and low rates of combustion, and Prof. Goss was limited to the use of tubes of one length. M. Henry demonstrated a few things that any engineer would have surmised. These are:

1. That with a given smoke-box vacuum the amount of fuel burned per hour decreases as the length of the tubes is increased.

2. That with a given length of tube, the amount of fuel burned per hour increases as the smoke-box vacuum is increased.

3. That with a given vacuum the amount of water evaporated per hour is dependent on the length of the tube.

4. That the amount of water evaporated per pound of coal increases with the length of the tube.

5. That the smoke-box temperature falls as the length of the tube is increased.

A combination of results 1 and 4 shows that the amount of water evaporated per hour with a given smoke-box vacuum reaches a maximum with a length of tube that varied from 13 ft. to 15 ft. 6 in. in length, according to the type of fire-box that was used with it, as well as the smoke-box vacuum. This length increased slightly with the vacuum.

It is at just this point that M. Henry's experiments cease to be of value to American designers, in that the vacuum employed was far beneath that used in the ordinary practice of this country. His vacuums were approximately 1 in., 2 in. and 3 in. of water, whereas Prof. Goss worked with from 2.2 in. to 5.6 in., while from 6 in. to 8 in. are not uncommon in the regular working of American locomotives.

With the vacuums that he employed M. Henry places the length of tube for maximum steam production at about 4.5 meters or 14 ft. 9 in. With a draft due to 7 in. of smoke-box vacuum this length will be somewhat increased, but, judging from the rate of increase from 1 in. to 3 in. of vacuum it does not seem probable that the length of tube for maximum steam production on American locomotives will be much, if any, more than 16 ft.

Of course, this is an entirely different matter from the greatest amount of water evaporated per pound of coal. The latter may increase indefinitely. M. Henry found that there was an increase, in this respect, all the way up to lengths of 7 meters or 22 ft. 11 in. Hence, when viewed from this standpoint, a tube length of 20 ft. or more may be advisable. But this is not the standpoint from which American railroad men are apt to look at the matter. There are heavy trains to haul at high speeds; the dimensions of the boilers are limited and the question of the production of the maximum amount of steam is the controlling element. The delicacy of adjustment is to be found in the balance between allowable back pressure and steam generation. As the former increases the amount of steam generated also increase as does also the amount consumed per unit of work done. The last point reaches its maximum when the back pressure and draft have been adjusted to produce the maximum amount of steam per unit of work.

Of course, the evaporation per pound of fuel is not to be neglected, for Prof. Goss found that there was a fall of 20 per cent. in evaporative efficiency by increasing the vacuum from 2.2 in. to 5.6 in. of water. Probably the difference in the amount of work done per pound of coal was even greater.

From the available data it seems probable that, under the ordinary working conditions of American locomotives, a tube length of between 15 ft. 3 in. and 16 ft. will produce the maximum amount of steam; while for economy in coal consumption greater lengths will give better results.

As for the effectiveness of the several sections along the tube, of course the greatest amount of evaporation takes place where the gases are the hottest at the fire-box end. Thus, with a vacuum of 3 in. M. Henry found that with a fire-box having a long arch and tubes 3 meters in length there was an evaporation of 8.70 lbs. of water per pound of coal. This increased with the length of the tubes as follows:

Length of Tube, meters	Water evaporated per lb. of coal.
3	8.70
3.5	9.22
4	9.62
4.5	9.90
5	10.08
5.5	10.17
6	10.22
6.5	10.26
7	10.29

Thus the increase in from 4 meters (13 ft. 1 in.) to 5 meters (16 ft. 4 in.) is a little less than 5 per cent. But in an increase from 5 meters (16 ft. 4 in.) to 6 meters (19 ft. 8 in.) the increase is less than 1½ per cent.

It seems improbable, therefore, that if experimental investigation should show that the maximum steam production can be obtained with tubes of about 16 ft. in length that it will pay to add even as much as 3 ft. to their length for the sake of the increased evaporative efficiency that will thereby be gained.

Again, from the data at hand it is only possible to indicate probabilities and these would seem to show that, for economy of working, development of power, first cost and interest on investment, a tube length of about 17 ft. will give the best satisfaction on American locomotives.

The field of investigation is one that will repay an

hundred fold for the time and labor that may be put upon it, and there can be no more profitable piece of work for a committee of the American Railway Master Mechanics' Association to do than to determine the best lengths of tubes to be used by the different classes of American locomotives.

GEO. L. FOWLER.

The Railway Signaling Club.

This club held its September meeting on Tuesday of last week at Atlantic City, N. J. About 20 members were present and also a number of visitors. Mr. A. M. Keppel (P. R. R.), the President, occupied the chair. Nine new members were admitted.

The first business was the paper of Mr. H. D. Miles (M. C.) on protection against lightning, which was published in the *Railroad Gazette* Sept. 17. In the discussion on this paper, a number of members who had had long experience in automatic blocking told what they had done to protect their signals from lightning.

Mr. Balliet (L. V.) uses "choke coils" for arresters, with a copper ground wire. In some cases he uses both an ordinary arrester and a choke coil, and to make sure of a good ground connection, sometimes uses three wires. In spite of these precautions some instruments have been destroyed this year; and as a result of this annoyance, four-ampere fuses have been restored; and lastly, some five, seven and ten-ampere fuses have been put in. Carbon points plated with silver or copper will fuse. In one case, the copper plating had worn off, so that the metal was hardly perceptible, but a stroke of lightning apparently burned a hole in the carbon itself. In using a metal plating on carbon, it was hoped to thus reduce the resistance while at the same time using such a thin plating of metal that fusing would not take place. As yet there is no satisfactory evidence that this expedient will be successful.

Mr. Yocum (P. & R.): We cannot use carbon contact points in track circuits, as the current will not work through them. We have tried metal plating of carbon but still have troubles from fusing; now use an improved arrester and a choke coil combined with it. The arrester has a plate divided into two parts, one part being connected to each rail. With this arrangement, the failures from lightning have this year been reduced 80 per cent. below former years. Fuses are a constant annoyance and it is doubtful if they add to safety. Asked if reducing or eliminating overhead wires would diminish trouble from lightning, Mr. Yocum replied that it would.

At this point there was a desultory discussion as to whether lightning always comes down from the sky (through the line wire) or sometimes reaches instruments from the rail. The assumption that it always comes downward was not universally accepted. It appears that in some localities the conformation of the hills, or the volume and direction of streams of water, or peculiar air currents which are frequent furnish favorable conditions, automatic signals are struck by lightning very frequently, as compared with the average of all such signals. At one point in Pennsylvania where there is a good deal of slate in the earth, automatic signals are sure to suffer by lightning in nearly every storm.

Mr. Jones (A. C.) has heavy thunder storms along his line, though it is a level country. There being no pronounced elevations, the lightning strikes in the sand or anywhere. This year, with choke coil arresters, there has been no trouble from lightning. It is difficult to get a good ground in the New Jersey sand, which is dry at a depth of 20 ft.

Mr. Wilson—The choke coil is useful when lightning strikes before the rain has wet the rails. Observation has shown that while the rails are dry, atmospheric electricity is turned to the ground at the choke coil, but as soon as the rails become wet and thus make better ground connections, the sparks at the choke coil will cease, and current will be carried off by the ordinary lightning arrester. Graphite has been tried in the spaces between the conductor and the ground plate of the choke coil, but is unsatisfactory because its resistance is not uniform.

Mr. Rhea (P., C. & St. L.) reported an experiment where a relay had been used in automatic signaling with double carbon points connected in multiple.

Inquiry being made as to how the Michigan Central could use carbon-point relays to repeat one track circuit into another, in view of the experience of the Reading, which had found too high resistance in such relays, it was explained that probably the Michigan Central circuits were shorter than those of the Reading, and that the nearness of the relay to the track and the size of the connecting wires would also be important factors.

Mr. Balliet had tried a copper-plated carbon point relay with the copper nearly all filed off and had used this in relaying one track circuit into another track circuit 2,700 ft. long; in two weeks the resistance was found too high, this condition being noticeable chiefly in the cool part of the day when probably there was some moisture on the points.

Mr. Keppel—Do not manufacturers make instruments too delicate, trying to accomplish too great refinement? Contact points should be made larger. We use 16-ohm, 20-ohm, 130 and 400-ohm relays and it is rare that the 16 or 20 are damaged by lightning. The coils of the track relay are rarely damaged by lightning. We use no fuses, choke coils, or lightning arresters, though we have in our territory as severe lightning as in any country that I have visited. Lightning is always erratic; it has entered our cabins and melted metallic parts all around the

instruments and yet has not touched the magnets. On a certain signal post, an air piston was melted when the electrical apparatus was not touched.

At the close of the discussion on troubles with lighting, a committee, of which Mr. C. C. Rosenberg (L. V.) is chairman, was appointed to investigate the subject further, to gather facts from men who had had experience, and to report to a subsequent meeting.

Mr. Lane (L. V.) read his paper on Back Lights, which has already been reported in the *Railroad Gazette*. The standard automatic signal on the Lehigh Valley has no back light.

Mr. Sperry (Union Switch & Signal Co.) read from a report made to the last International Railroad Congress, showing that in England the general practice is to have a white back light, to indicate arm horizontal; with the light hidden when the arm is down. Mr. Lane stated that on the Lehigh Valley the back light in interlocking signals shows blue for a horizontal arm, and white for the other position; but it has been decided to show nothing but the blue, having the light covered when the arm is down.

Mr. Cade (Standard Railroad Signal Co.), referring to the arguments in favor of total abolition of back lights, admitted that they might not be necessary on automatic signals; but on interlocking signals, which are placed with their backs to the cabin, they are needed. An accident from absence of a back light is more likely to be disastrous at an interlocking plant than at a signal which is purely a block signal. The speaker thought that back lights ought to show in both positions of the arm; this for the purpose of preventing delays. Signals do not go to the clear position so well in the night as in the day time.

Mr. Wileman (L. S. & M. S.) has got rid of objectionable excessive luminosity in back lights by using ground glass. Mr. Rhea, dealing with the same difficulty, has reduced the size of the opening to $\frac{3}{8}$ in. diam., still using clear glass.

Mr. Sperry called attention to the fact that the troubles with back lights, which caused so much discussion, will be mostly abolished when we adopt green for all clear and thus deprive white lights of any indicating power.

This discussion ended the meeting. The next meeting will be held at St. Louis, Nov. 13.

The Traveling Engineers' Association.

The eighth annual meeting of the Traveling Engineers' Association was held at the Colonial Hotel, Cleveland, Ohio, beginning Tuesday morning, Sept. 11, and lasting four days.

There are now 339 members and there is a balance of over \$1,600 in the treasury. During the time the Association was in session five reports of committees were received and discussed, the following being abstracts of the reports and discussion.

Mr. P. A. Stacks, the President, in his opening address, referred to the difficulty experienced in firing recent heavy locomotives with one man, pointing out that a good deal can be done to facilitate the work of the fireman by arranging the cab fixtures conveniently. Also, that the back boiler heads of such engines should be covered.

Packing and Care of Locomotive Journal Boxes.—Committee: Chairman, D. Meadows, Michigan Central; W. C. Hayes, Baltimore & Ohio; J. J. Watson, Chicago & Northwestern; J. F. Walsh, Galena Oil Co., and J. C. McCullough, Pittsburgh, Cincinnati, Chicago & St. Louis.

The committee finds that woolen waste is generally preferred to other kinds for packing locomotive journal boxes on account of its greater elasticity, but one road uses cotton waste entirely and another uses old rope in the cellars. A number favor cotton waste for the tops of driving and engine truck boxes, as its close fiber better prevents dirt from getting down in the oil holes, and gives a more gradual feeding of oil. For this reason a few use wool waste on top of boxes in winter and cotton waste in summer. All sending information say that the waste is soaked from 12 to 48 hours, and then the surplus oil is allowed to drain from it before the waste is used, as saturated waste is soggy and in a short time settles away from the journal. Shop men generally attend to packing these boxes, and the methods of packing differ somewhat as well as the frequency of examining the packing. Some examine the cellars and tender boxes after each trip, some once a week, one after the engine has made 5,000 miles, while others, especially in freight service, do so only when reported by enginemen. Oil is commonly used alone for a lubricant, excepting a few use graphite with the oil on hot journals. The packing on top of boxes is usually renewed only when it becomes hard or dirty, and then, after cleaning off the top of the box, a number blow out the oil holes with air or steam and repack with new waste only. It is considered essential by the committee that at terminals special men be assigned to do all the oiling and packing, and to prepare the waste, which should be soaked for at least 24 hours. The committee favors the use of wool waste for packing the cellars and cotton waste for the packing on top of boxes, excepting in winter when wool waste alone is preferred.

The discussion confirmed the findings of the committee as to the general practice of caring for locomotive journal boxes. Mr. W. J. Walsh, Galena Oil Company, criticised the practice of tying the waste in rolls before placing it in the cellars, as in this way the object of using elastic woolen waste is partially defeated. Others pointed out that the cellars were not always so fastened that they will stay

fixed in the boxes and hot boxes often are caused from such mechanical defects; the cellars should be square with the axle and held so that they will not work up and down. Several reported trouble from the journals of recent heavy engines heating, due in different cases to an improper distribution of the weight, from failure to use good bearing metals and from hub friction. Both the pooling system and long locomotive runs were said to be conducive to hot journals. It was suggested that the design of the cellar should be improved so that the packing could be examined without removing bolts, which brought out the statement that the Plant System is using such a cellar having a plate on the inside which protects the waste. With heavy mogul passenger engines the New York, Ontario & Western has got improved results by placing a third bearing at the center of the second and rear driving axles, which central bearings take a portion of the weight. On the mogul engines, the central bearings carry about 10,000 lbs.

Mr. J. L. Martin, of the Gulf, Colorado & Santa Fe, submitted the driving box records of 78 engines run in a pool from May 1 to Oct. 31, 1899. The engines were run in a hot, dry region and the boxes were packed loosely, the packing being removed only when burned. Six pints of oil were used to a pound of waste, and the waste, after being drained, was placed in the cellars in three rolls. Cotton waste was used on top of the boxes. In 99 cases the packing was in good condition. When not in good condition the causes were: Insufficient waste in cellars due to the waste containing too much oil when applied, 98 cases; packing dry, 63; no babbitt in brass, 24; packing dirty, 17; fire falling from ash pan, 17; journals scratched and rough, 9; packing worn out, 5; brass loose in box, 3; oil holes stopped up, 3; cellars packed too tight, 2; cellar bolt lost out, letting cellar down, 1; and cellar broken, 1. Attention was called to the large number of cases where the waste settled away from the journal because when applied the waste contained too much oil. On that road in re-babbitting brasses the cellar is removed from the box requiring attention and the box is jacked up 1 in. or more off the journal and any babbitt left in the grooves is chipped or burned off. A piece of paper is then laid on the journal-box to keep the babbitt from getting chilled, and a sheet of tin is placed above this and babbitt is poured in the grooves by using putty to guide the hot metal. This method is said to save considerable time.

Handling Air-Brake Trains.—Committee: Chairman, T. A. Hedendahl, Westinghouse Air-Brake Co.; C. P. Cass, Westinghouse Air-Brake Co.; W. B. Galivan, Baltimore & Ohio Southwestern; C. P. Lovell, New York Air Brake Co., and G. C. Parker, Fremont, Elkhorn & Missouri Valley.

This subject was treated quite fully at the Jacksonville meeting of the Air-Brake Association last April, and the present report covers much the same ground. A few points only will be noted. The committee calls attention to testing the brakes before leaving terminals and making sure that none of the brakes and draw gear are defective. Two applications are recommended instead of one for service stops with passenger trains, releasing just before coming to a stop; the first application should be a heavy one suited to the speed at which the train is running. When required to use sand, the brakes should not be applied until the track has been sanded for a full train length.

Service stops with freight trains should be made with one application, the brakes being held on until the train is stopped. In taking water or coal, freight trains should be stopped before reaching the objective point and the locomotive detached from the train. Heavy initial reductions are recommended for freight service, after the slack is taken. In running double headers where it is desired to use the air pumps and main reservoirs of both engines, the best practice is to close the cut-out cock in the train line under the brake valve of the second engine and to make the necessary connections with additional piping. The practice of the second man cutting in at the proper time to recharge and again closing the cut-out cock before the brakes are re-applied has given fair results, but it is open to criticism owing to the chances for mistakes. The practice of lapping the brake valve of the second engine is strongly condemned. Fixing an arbitrary excess pressure to be carried for all conditions of service is unreasonable and is not recommended, but rather the size of the main reservoir and the excess pressure should be determined by the actual requirements. The paper concludes with "Forty Don'ts" for enginemen, which includes the most important cautions against improper care of the air-brake apparatus.

The first speaker, in discussion, Mr. McAuliffe, of the International Correspondence School, said that the value of the terminal test of air-brakes was lessened in value as it was generally made at a time when the engineman was in the telegraph office waiting for orders. As it is possible to judge pretty closely the length of train pipe cut in, by noting the time required to exhaust for a full reduction, as well to judge of the working of the brakes, this test should be made by the engineman operating the brake valve.

There was a long discussion as to whether enginemen should be instructed to make one application or two, in a service stop with a passenger train. Finally a motion was carried that it was the sense of the meeting that it is the best practice in passenger service to make a somewhat heavy initial service reduction so as to shorten the time of stopping and use air economically. When rail conditions favor wheel sliding, two applications are better, the second application being light. The chief argu-

ment in favor of a single service application seems to be that most enginemen have learned to operate the brakes in that way, although great skill is required to make accurate stops. The advantages of two applications are that the heavy initial reduction is made at a time when the train is running at high speed, consequently when the brake-shoe friction is least, and when there is no danger of skidded wheels. Releasing and applying the brake lightly after the speed has been reduced to about six miles an hour enables the stop to be made accurately and with no danger of wheels sliding, even when passing muddy street crossings near stations. This method of handling passenger trains is advocated by most of the best air-brake men and is being used successfully; in a number of instances it has had to be adopted solely to reduce the number of slid wheels.

In handling long freight trains, large main reservoirs and high excess pressures are necessary and care must be taken in releasing brakes at low speeds; at speeds as low as six miles an hour it is not recommended to release until the train has fully stopped, to avoid break-in-twos. On heavy grades, the practice is recommended of keeping the maximum speed down and close to the average by a series of heavy applications, each time releasing and placing the brake valve in running position so as to recharge; in this way the air supply is maintained and the retaining valves are of use. Tests on the Northern Pacific, described in our issue of April 27 last, have demonstrated that this is without doubt the safest way to operate heavy trains on steep grades.

That the break-in-two with recent heavy equipment is becoming a serious matter was brought out by Mr. L. D. Gillett, of the Norfolk & Western. As is well known that road has numbers of large capacity coal cars, but it is necessary to run these in trains with smaller cars having draft gear designed for much lighter service. Mr. Gillett said that in one instance such a train had parted 32 times in going 100 miles, and that the trouble was wholly with the weak couplers and draft rigging, and that the engineman should not be held accountable for failures of this kind. Other roads operating large cars and locomotives are said to be having similar troubles on account of weak draft gear and couplers; these failures are commonly charged to improper handling of brakes.

The Steam Engine Indicator.—Committee: Chairman, G. W. Wildin, Plant System; C. B. Conger, Locomotive Engineering; W. G. Wallace, Chicago & Northwestern; W. P. Steele, Boston & Maine, and A. S. Erskine.

This is a report of 159 pages, as printed in the advance sheets, and brings together a lot of information which will be especially convenient and useful to the members. The committee makes the point that the steam engine indicator should be used regularly by Traveling Engineers to show the performance of locomotives, and to form a basis for valve setting, and three reasons are assigned for the common failure to indicate locomotives. First, that the men in charge of the locomotive departments do not appreciate the advantages of the indicator; second, that a general opinion prevails that only an expert can take indicator diagrams, and third, that the literature on the steam engine indicator is full of details and suggestions, which could not be carried out in actual service tests even if the ordinary man could comprehend them. The object of the committee has been to present only the essentials of indicator work in a simple manner.

Part I, includes a valuable discussion by Prof. R. A. Smart, of Purdue University, which is accompanied by numerous examples of indicator diagrams taken on the locomotive testing plant expressly for the committee. These several cards show the effect on the indicator diagram of springs of different scales; the effects of excessive and negative lead, and long indicator pipes; variations due to throttling, to cut-off and to speed, insufficient lubrication, and Allen valves, and also the effects of contracted steam and exhaust passages. It is also shown that if the release of the steam occurs at equal piston positions on the four ends, the engine will sound a little "lame," and conversely if the engine sounds "square" the release is not equal on the four ends. In other words, a "square" engine does not mean an equal distribution of steam in the cylinders.

The committee also presents cards from other sources showing the effect of the size of the exhaust nozzle on the back pressure in the cylinder and how the indicator can be used as a guide to valve setting. Part II contains information regarding diagrams from compound locomotives furnished by the Schenectady, Richmond and Baldwin Locomotive Works, together with recommendations by the committee for taking cards. Part III contains definitions and convenient tables and formulas, and Part IV is descriptive of several indicators, planimeters and other apparatus, the information being furnished by the makers.

The discussion showed that few of the Traveling Engineers had had much experience with the steam engine indicator but its use promises to become common and the subject will be again discussed at the next meeting. It is anticipated that the indicator will be especially useful in correcting the setting of valves and locating the causes for poor locomotive performance as it furnishes tangible evidence which can be submitted to the mechanical officers.

Smokeless Firing.—Committee: Chairman, J. H. Burns, Burlington, Cedar Rapids & Northern; D. R. McBain, Michigan Central; J. Grey, Santa Fe Pacific; D. H. Bair, Southern Pacific and W. L. Kellogg, Chicago, St. Paul, Minneapolis & Omaha.

In answer to a circular letter, 16 replies were received which show all grades of opinion and experience. It would seem that smokeless firing is generally understood

to admit of some brown or grey smoke, at times, but no black smoke. A number claim to have been fairly successful in eliminating black smoke through instructing the enginemen to carry a light fire, handle the engine and injector carefully, by using a brick arch and by having the coal broken to a suitable size; the education of the enginemen is considered of the first importance, and the use of a brick arch next. A few claim a saving of fuel when the engine is worked without making black smoke, but most make no claims for economy, considering smokeless firing an advantage by adding to the comfort of passengers. Most replying, consider the brick arch the only special device needed. One, however, considers that the best results are got when the engine is fitted with a fire-box and grate of sufficient depth and size to make steam without excessive forcing of the fire; and when equipped with a brick arch, combustion tubes and proper draft appliances; also, when the coal is of the proper size and not too green or too dry. Another favors a fire door having a deflector plate on the inside. The kind of coal is held to have a great deal to do with the amount of smoke made.

Mr. Kellogg, a member of the committee, furnishes a description of the good results obtained on the Burlington, Cedar Rapids & Northern by firing one shovel of coal at a time. There the engines are fitted with brick arches, the flues are bored out after each trip, strict attention is paid to draft appliances, and the coal is broken before it is put on the tender. Mr. Kellogg, in discussing the general subject of smokeless firing favors the "one shovel" plan and calls attention to the effects of different kinds of coal, a coal which clinkers badly, requiring great vigilance on the part of the firemen to prevent the fire-box filling up; unless the fire can be kept clean, black smoke will be made. The fireman, while one of the principal factors, is considered not wholly responsible for black smoke. The engineman can greatly assist, by handling the engine carefully when leaving stations, giving close attention to boiler feeding and notifying the fireman before shutting off. The size of train for a given engine also has much to do with the amount of black smoke made and the proportion of grate area and heating surface has an important effect. To get the best results the draft appliances must also be kept in good order, the flues must be clean and tight, and large tight ashpans are necessary, having plenty of damper area, while the grates must be designed according to the quality of coal used. Injectors should be suited to the size boiler used, so that the feeding of the boiler can be closely regulated. The brick arch is considered a necessity, but arches must be kept in good repair and clean. Compound locomotives are said to be easier to fire without black smoke than simple engines, and attention is called to some of the older engines having badly worn cylinders from $\frac{1}{2}$ to $\frac{3}{4}$ in. larger than when new. To make possible smokeless firing with this class of power, the cylinders should be bushed to or below the original size. Feed water heaters, utilizing the exhaust from the air pump, improve the steaming qualities of engines and indirectly reduce the black smoke. The maintenance of way department can assist by improving the profile of the road so as to reduce the variable conditions, but chiefly in avoiding locations of switches, stations and water tanks in sags or at the foot of grades. Train dispatchers by issuing as few rush orders as possible can help and the purchasing agent and coal inspectors can do much by furnishing each division as nearly as possible the same grade of coal. After the engines are once fitted to burn one kind of coal, the chances are that some other grade cannot be burned so satisfactorily without experimenting and adjusting. Conductors on freight trains can help in avoiding black smoke by giving the enginemen, in advance, an outline of the work they have to do, the stations at which they will have to stop, etc. From Mr. Kellogg's discussion it is clear that all departments must co-operate if any important progress is to be made in avoiding black smoke.

The report concludes with the article published in the *Railroad Gazette*, April 27 last, describing the results got by the Southern Pacific, burning bituminous coal without smoke, and the illustrations of the appliances used on those locomotives are reproduced in the report. The Southern Pacific and the Burlington, Cedar Rapids & Northern have apparently given this subject more systematic attention and have attained better results than other roads in this country.

This is not only evidenced by the report but was brought out by the discussion. A number of Traveling Engineers of other roads having recently visited the Southern Pacific and Burlington, Cedar Rapids & Northern, stated that those roads are really doing all that has been claimed. However, when it has been tried to get similar results on their own roads, the results have been only partially successful because the engines have not been properly equipped, the same care is not taken in the maintenance of the engines and the several departments do not co-operate with each other as they do on the two roads named. It is thought that the fire doors used by the Southern Pacific are a great aid to smokeless firing. It will be remembered that these doors have a deflector plate on the inside and a small opening which is never closed, and through which the coal is necessarily charged in small quantities. The New York, Ontario & Western now has eight engines fitted with these doors and reports that their use has resulted in marked improvements, and that good results are got with either lump or slack coal; new men soon get accustomed to the small fire door openings. Some of the Canadian roads are also making trials of the Southern Pacific methods and appliances.

The discussion in brief may be said to have brought out the fact that these two roads are burning bituminous

coal in all classes of service with practically no black smoke. This is now done as the result of a careful study of the conditions, and much attention to the smoke problem on the part of all the officers from the General Manager down. It is thought that other roads taking up the question in the same way can get similar results, but that it cannot be done simply by issuing a few bulletins of instructions to the enginemen; as have been tried in a number of cases. Each department must do its part.

Connections Between Injectors and Locomotive Tanks.—Committee: Chairman, L. D. Gillett, Norfolk & Western; S. L. Kneass, Wm. Sellers & Co.; E. W. Brown, Erie; J. C. Currie, Nathan Mfg. Co., and C. H. Hogan, New York Central & Hudson River.

The committee considers it advisable to have the tank valves, goose necks and all channels leading to the suction end of the injector a size larger than is called for by the injector connection so as to insure the proper supply of water, reduce friction and make allowance for any partial obstructions. It also urges that the present conical strainer be abandoned as a nuisance and that stationary strainers of large area and with openings not larger than $\frac{1}{8}$ in. be placed around the valve in the tank. These can be made accessible for purposes of cleaning by means of a trap. Also an increase in the size of all suction pipes and accessories is needed on account of the better working of injectors as these fittings have not been enlarged, although with large modern engines the capacity of the injectors has been increased about 75 per cent. The following sizes for the inside diameters of suction pipes are suggested: For Nos. 5, 6 and 7 injectors, 2 in.; for Nos. 8, 9 and 10 injectors, $2\frac{1}{2}$ in., and 3 in. pipe for all injectors larger than No. 10. As few points as possible should be used. It is also recommended that injectors be placed as low as possible to reduce the lift, but keeping them above the water line. The committee also reports that 11-16 in. is found the most suitable diameter of opening for No. 10 Monitor injectors. The recommendations of the committee were approved and the Secretary was instructed to bring this report and the discussion to the attention of mechanical officers, as larger suction pipes and improved strainers are considered espe-

cially important. Present arrangements are often the cause of engine failures.

Officers Elected.—Philadelphia, Pa., was selected as the next meeting place, and the following were elected officers for the ensuing year: President, C. H. Hogan, New York Central & Hudson River; First Vice-President, W. G. Wallace, Chicago & Northwestern; Second Vice-President, D. Meadows, Michigan Central; Third Vice-President, H. J. Beck, Central Railroad of New Jersey; Treasurer, C. A. Crane, Atchison, Topeka & Santa Fe, and Secretary, W. O. Thompson, Hancock Inspirator

bridge crosses Kalamazoo river on South Jefferson street, which is one of the principal thoroughfares of the city. For this reason it was necessary to delay traffic as short a time as possible. Work on the bridge was begun on Sept. 15, 1899, and it was completed and opened for traffic on Nov. 20, 1899. The centers were not removed until Jan. 12, 1900. After the centers had been removed the bridge was tested for a live load of 150 lbs. per sq. ft. The test proving satisfactory to all concerned, the bridge was accepted by the city.

The bases of the abutment walls are 6 ft. below the



Fig. 1.—Melan Arch Bridge Construction.

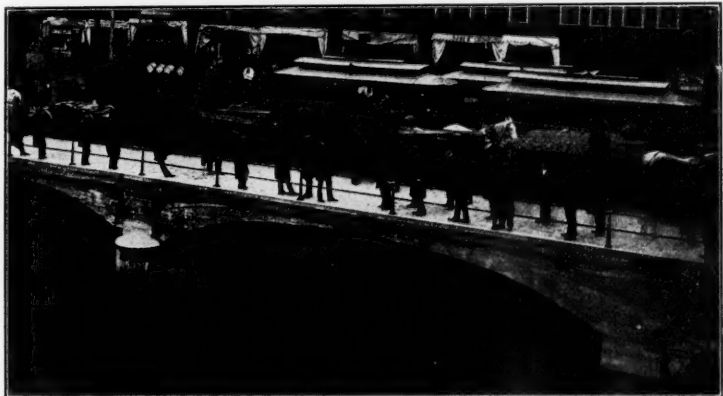


Fig. 2.—Melan Arch Bridge—Battle Creek.

Company. Mr. C. B. Conger was re-elected a member of the Executive Committee.

The following is a list of subjects for reports at the next meeting:

What benefits have been derived from the steam engine indicator?

Methods of firing locomotives to get the best results.

Care and operation of locomotive lights.

Maintenance, care and handling of compound locomotives.

bed of the river, and the base of the pier is 7 ft. below the river bed. The pier is 5 ft. wide at its base, while the abutments are 14 ft. at the base. Hydraulic cement concrete, in the proportion of 1 : 2 : 4, was used up to an elevation of 1 ft. below the bed of the river, and Portland cement concrete, 1 : 4 : 8, up to the springing lines. The concrete in the arches was in the proportion of 1 : 2 : 4. Twenty-one ribs of 6 in. I-beams, bent to the curvature of the arches, were imbedded in the concrete in each arch. The exposed surfaces of the bridge are of Portland

EXHIBITS.

The following companies had exhibits:

American Brake Co., St. Louis Mo.—Model of the McKee slack adjuster.
Bierbaum & Merrick Metal Co., Buffalo, N. Y.—Samples of "Lumen" bronze bearings.
Michigan Lubricator Co., Detroit, Mich.—Drawings and samples of the "Michigan" lubricator.
Lunkenheimer Co., Cincinnati, O.—Samples of injectors and valves.
Peerless Rubber Mfg. Co., New York.—Air-brake hose, steam hose and packing.
Hancock Inspirator Co., Boston, Mass.—Samples of the "Hancock" and "Metropolitan" injectors, gages, boiler checks, valves, strainers and other locomotive fittings.
William Sellers & Co., Philadelphia, Pa.—Samples of "Sellers" injectors and tank strainers.
Chicago Pneumatic Tool Co., Chicago.—Samples of pneumatic drills and hammers.
Detroit Lubricator Co., Detroit, Mich.—Drawings and samples of the "Detroit" lubricator with the "Tippett" attachment.
Cook Cooler Co., Flint, Mich.—Samples of the "Cook" journal cooler and locomotive cellar with water attachments.
Nathan Mfg. Co., New York.—Samples of injectors and lubricators.
Shelby Steel Tube Co., Cleveland, O.—Samples of seamless, cold-drawn steel tubes for locomotive boilers.
Other companies represented were: Sargent Co., Chicago; Ohio Injector Co., Wadsworth, O.; Galena Oil Co., Franklin, Pa.; Lappin Brake Shoe Co., Bloomfield, N. J., and the Pyle-National Headlight Co., Chicago.

A Melan Arch Bridge.

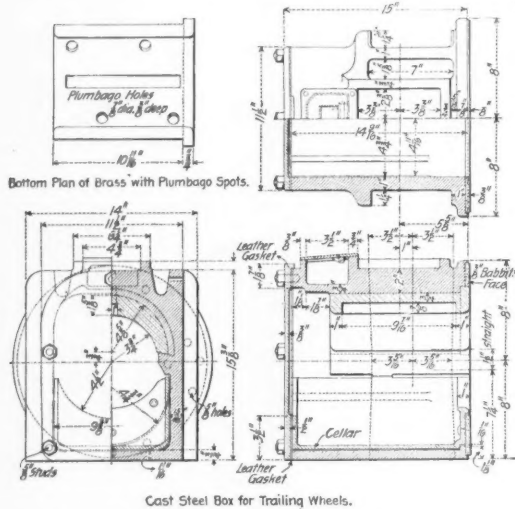
The accompanying photographs show two views of a Melan arch bridge which was built in Battle Creek, Mich., in 1899. The bridge consists of two 42 ft. spans; the total width of the bridge is 66 ft. and is taken up by a roadway of 46 ft. and two sidewalks of 10 ft. each. The

cement mortar in the proportion of 1 : 2. Brick was used for paving the roadway, on which are two street car tracks. The sidewalks are made of cement.

The work was executed by the Grand Rapids Bridge Co., of Grand Rapids, Mich., under the inspection of Mr. E. N. Hunt, City Engineer. The bridge was designed by the late Mr. Marc J. Reiser, M. Am. Soc. C. E., Grand Rapids, Mich., under the patents owned by the Melan Arch Construction Co., of New York.

Details of Class "D" Passenger Locomotives of the Chicago & Northwestern.

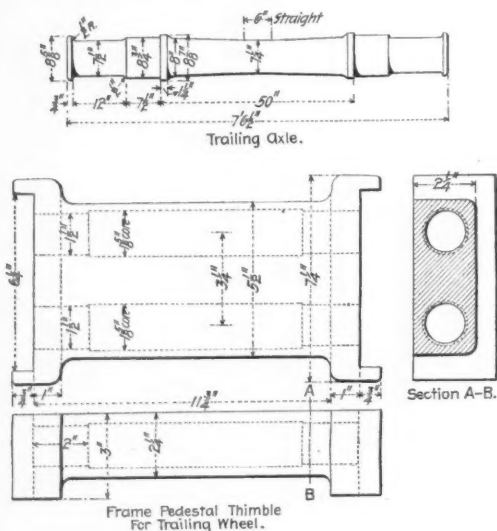
Supplementing the general description of the new "Northwestern" type locomotives published in our issue of Aug. 3, we are now able, by the courtesy of Mr. Robert Quayle, to illustrate the most interesting details of the engines. The reader, however, is referred to the earlier



description, as only special features will now be mentioned.

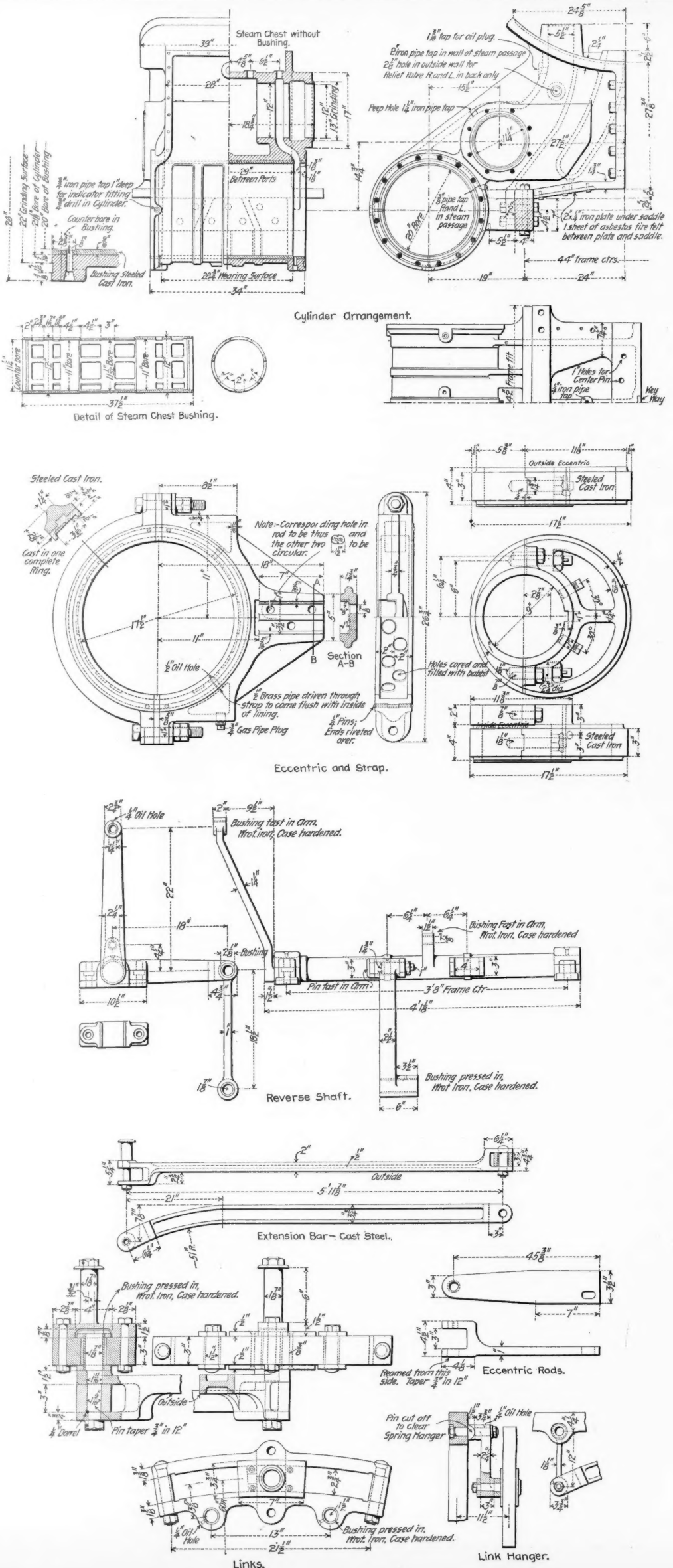
On account of using a grate 65 1/4 in. wide and a deep fire-box it is necessary not only to drop the frames at the rear but to spread them and provide pedestals for the rear trailing axle. The design of the rear frames of the Northwestern engines differs from the design used for the "Prairie" type engines of the Chicago, Burlington & Quincy.* As shown by the engraving the main frame is here increased in depth and reduced in width back of the second drivers, but it is continued through to the rear of the engine, clearing the trailing axle. The 1 1/4-in. auxiliary plate frame extends the length of the fire-box and carries the expansion pads and the cast-steel pedestals of the trailing axles. In the "Prairie" type engines the main frames are divided back of the last driving wheels, and the rear portion, which supports the fire-box, is set out. Both sections of the frame are attached to a heavy cast-steel cross bar at the front of the fire-box.

A drawing of the trailing axle, which carries 34,000 lbs., is shown and also the details of the rear pedestal timbles and cast-steel journal-box of the last axle. This box, it may be seen, is carefully fitted and closed at the front by a vertical plate held by bolts, the joint being made with a leather gasket; the face next the wheel is babbitted and holes in the face of the brass are filled with plumbago. Near the front and on top is an opening through which the box can be oiled without removing

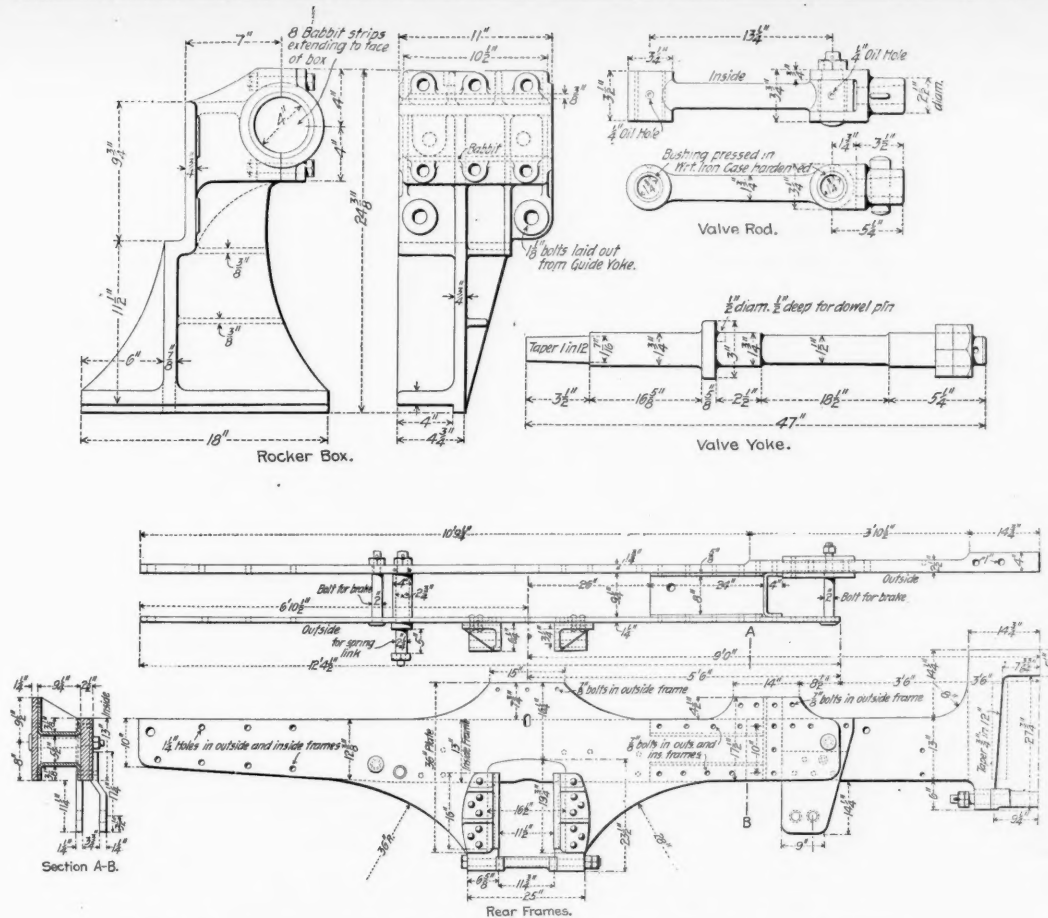


the front plate. This opening is covered by a lid 2 x 3 1/2 in. that is held in place by a spring, the surfaces forming the joint being machined.

The cylinder arrangement is shown. The valve chambers are not placed as is usual, but are just outside the frames and close to the cylinders. The position is made possible by certain modifications of the valve gear, and it results in short direct steam passages to and from the valve cham-



*Illustrated Railroad Gazette, March 30 and June 22, 1900.



Details of Valve Gear of the Class "D" Locomotives of the Chicago & Northwestern.

ber. The cylinders are bushed with 9-16-in. bushings which give hard wearing surfaces, even though soft, tough, iron is used for the cylinder and saddle castings. The piston valves are 11 in. in diam. with internal admission.

The details of the valve gear are given and are interesting, as with this design the valve chamber can be located to the best advantage. This is accomplished by using a cast-steel extension bar with forked ends, which, together with the hanger, engages the pin in the link block. The bar is curved at the rear end, and is so inclined as to clear the forward driving axle. The front end of the extension bar drives one arm of a rocker, while the other arm, also pointed downward, is connected to the short valve rod. The rocker box, which is illustrated, is cast-steel and is bolted both to the frame and to the guide yoke. The extension bar, hanger and rocker form a parallel motion which transmits directly the motion of the link block to the valve rod, this direct transmission being required on account of the use of valves with internal admission. The details of the reverse shaft, hangers, links, eccentric, eccentric straps, valve rod and yoke, are also shown. The drawings of the piston valves were published Aug. 3, together with a photograph and general drawing showing an elevation and sections.

Education of Railroad Men for Maintenance of Way.*

Mr Berg starts out with the proposition that there are three principal points to be kept in mind in discussing the question of the education of railroad men. First, a clear division should be recognized between the education of the higher class of railroad officers and the middle class of railroad men. Second, the higher class, those who will go on to be managers, professional men and heads of departments, should have a college course. Third, the middle class, comprising those who cannot spend the time or money for a college course, and those who for various reasons will probably never advance to the higher positions, should have a special short preliminary schooling after leaving the public school.

The European governments long ago recognized the necessity for a strict distinction between professions and trades or callings. They emphasize throughout their national educational schemes the fact that an institution cannot accomplish two different objects at the same time. Their universities command the highest respect for their graduates, while their industrial or trade schools turn out men fitted for better-class labor, artisans, foremen and supervisors.

Many parents can afford to give boys two years' extra schooling after leaving public school, whereas it would be out of the question financially, independent of any other considerations, to let the boy go through college. My contention is that we have no well-recognized system for giving these men a special adequate preparatory technical education subsequent to their leaving public school and that special railroad trade schools should be established for this purpose. These schools would be to the subordinate branches of railroad work what commercial schools or so-called business colleges are to business.

*Extracts from a paper by Walter G. Berg, Esq., Chief Engineer of the Lehigh Valley R. R., presented at the eighteenth annual convention of the Eastern Maintenance of Way Association at Saratoga Springs, Sept. 19.

They would, as a rule, be interpolated between the regular public school course and a boy's entrance into practical railroading.

Heterogeneous elements cannot be shaped in the same educational mold, and combination systems can never meet successfully the educational requirements of all the various classes of railroad employees. In other words, any contemplated educational system should define specifically which grade of railroad men it is primarily intended for and be strictly arranged accordingly.

Having indicated briefly the objectionable features of relying on colleges to offer the special training under discussion, it remains to discuss the other ruling tendency in this country, namely, to place a boy after completion of the public school course in an office, shop or gang, and to trust to his industry, ability, energy, grit, and frequently luck to advance him to lucrative and responsible positions in the service. Many an example could be cited of boys who had started thus and subsequently climbed to the pinnacle of success, supplementing their early deficient training by private study or night schools. But these are exceptions, and in considering general educational problems we have to deal with the masses, not the exceptions.

Unfortunately, we have in this country a large number of men who decry any special schooling and brush all arguments aside with the well-worn phrase that practice can only be taught in practice. The misplaced belief in the absolute truth of this sweeping assertion regarding the inability of a special school course to teach anything bearing directly on practical work, has caused thousands of boys, not only in the railroad service, but also in mechanical and industrial pursuits generally, to be consigned yearly to the same fate and to follow the same rut as others before them, sometimes ascertaining the theory and the broader principles underlying their particular work after years of steady toil, but more generally remaining on the level of mediocre drudgery. Unless some stimulating influence be kept alive, or the boy's interest in his calling awakened, and his observing and reasoning faculties trained and developed prior to entering practical life, he will labor under the great disadvantage of never being able to fully grasp the general scope and duties of his calling, taken as a whole. He may become familiar with its general features by being thrown in constant contact with the subject for many long years; but experience is a very slow teacher, and usually costly to the party who pays the bills.

The natural tendency of work in a shop, office or gang to-day is to concentrate the worker's attention on the details of a single process, method or system. From my experience, I have formed the conclusion that the men very seldom make use of the wonderful opportunities for observation and improvement supposed to be afforded them. The routine work confines them to one machine or one class of duties for days and months at a time, and even the entire shop or office taken as a whole, only illustrates one particular branch of the work.

The educated employee, on the contrary, would enter his calling with a good general idea of the subject before him, and of the important principles involved, together with a knowledge of kindred subjects and familiarity with auxiliary branches. He will not be forced to work in the same channel as others before him, prescribed by

usage and tradition, but will reach correct conclusions by his knowledge of principles and acquaintance with the work and results of others in the same field. In place of understanding only one branch of his calling, like the machinist assigned to one machine, or like the clerk checking off figures from morning to night, he will be better prepared, when the opportunity presents itself, to launch out and demonstrate his ability to attend to more than one detail of his business, or to supervise the work of others in the same department. Uneducated inventors have squandered years of valuable time developing and ascertaining one principle, or demonstrating to themselves the fallacy of a certain line of reasoning, which the educated mechanic understands and fully realizes at the start. A clerk will labor for months and years over his books, rate-sheets and statistical statements, and may never grasp understandingly the general principles and rules governing his work.

Recruits for the maintenance of way service are obtained more by chance than owing to any special fitness or inclination of the applicant for this class of work. It is not the calling that he has selected but the fact that he was able to get the job. The proposed preparatory trade school would call for a selection on the part of the boy of the line of work he intended to embrace in life and aid in awakening his interest in his work, thereby lifting him from the ranks of a common laborer to the dignity of a man with a trade or calling to look forward to. After entering practical work he will not look on with unfeigned awe or stolid indifference, as being entirely beyond his sphere, when older workmen are consulting plans or the foreman is applying the ordinary rules of arithmetic to some detail of the job or sketching on a board with chalk the way he wants a joint connection made or a stick of timber framed. He will feel that this is to be part of his future work and within his power to do it after mastering certain practical points. Reading plans, making small off-hand sketches, applying the elementary mathematics learned at public school to concrete problems, ability to reason and think logically and to grasp intelligently the scope of the work in hand and the general results aimed at, all these features will certainly aid the educated beginner and raise him at once above the raw boy apprentice or common laborer.

Another important element of the preparatory education will prove to be the development of the boy's faculty to study and learn from technical books and to direct his attention to the existing literature pertaining to his calling.

Another advantage to the young men will be the creation of an ambition to learn and advance in their calling and the greater likelihood of their paying more attention to the technical press, one of the best sources of current technical information that can be consulted. I have dwelt on this subject of the knowledge of the existence of and ability to use technical popular literature, as I have frequently found that intelligent mechanics and railroad employees not only remain ignorant on many subjects by not consulting existing books of information, but generally do not even know that such books and sources of knowledge are open to them.

Another serious drawback to the advancement of an otherwise good workman is frequently his inability to master the routine clerical work and simple accounting methods accompanying certain higher positions in the service. The special preparatory school would give instruction on these subjects and thus remove the bar to promotion.

It does not seem preposterous to suggest that every important railroad center should have a large, well-equipped railroad trade school, for the education of the better class of railroad employees and artisans, with a view to giving them a training consistent with their elementary schooling and the means at their command. One important feature, however, should be kept prominently in view, namely, never mind what the inducements might be to devote energy and time to the higher theoretical and professional general branches of railroading, the first aim of the school should be to educate the better class of railroad labor, artisans, foremen and supervisors, giving them a special preliminary general training for the immediate practical duties before them.

I present, as a supplement to my remarks, an outline sketch and programme for such a special railroad trade school, illustrating the general features and characteristics of the school, the details being necessarily subject to changes and modifications dependent on local and individual conditions. The programme is substantially the same as formulated and published by me in 1887.

Programme for a Special Railroad Trade School.

The institution should be conducted according to the spirit and on the basis of a trade school. The entrance requirements would be limited to a general common-school education.

The school would consist of a regular course of one year, and of an advanced course of one year; also a general course. The scholars for the regular course would be young boys direct from public school and young men who have had a few years' work in a shop, office, store or railroad department. The advanced course would be open to such scholars who have completed the regular course, and whose means and abilities enable them to pursue their special studies to a higher point; also, men whose former education and subsequent railroad experience would qualify them to omit the regular course. The general course, consisting of lectures on general railroad subjects, would be open to all comers.

The studies in the regular course would be so arranged that the course in itself would be complete from a practical view. Practical railroaders could attend this course without fear that the matter presented would be too high or extended

for their purposes. In the advanced course the fundamental idea would be to build upon the general basis established by the regular course, to extend the different subjects to a higher grade, treating them in a more thorough and scientific manner. The general course would consist of evening lectures at stated intervals on the most general laws and conditions governing the control, operation and management of carrying companies, their relations to the State authorities and the public at large, their history and influence in industrial, trade and labor questions.

The choice of the teachers and managers would be most important. The salaries offered should be such as to induce practical men, whose standing in the railroad service is well known, to relinquish their positions and devote their talent and energy to the furtherance of the school as a life object.

The special departments or groups of railroad callings for which provision should be made are as follows: Accounting and auditing, general railroad appliances and supply business, traffic, transportation and operating, telegraphy and signals, motive power and mechanical, car building, construction and roadway, buildings, bridges.

The groups affecting more particularly the Maintenance of Way Department would be construction and roadway, buildings, and bridges. The studies for these groups would be similar to the following programme which is in general indicative of the character, trend and scope of the work to be accomplished.

Construction and Roadway Department.—Regular Course, First Term: Elementary bookkeeping, department reports and accounts, general description of railroads, their equipment and management; practical mechanics; movement of heavy bodies and hoisting machinery; clearing wrecks; properties of materials; duties of sectionmen and supervisors, and means and methods at their command; description of track material and implements, with their use; mechanical and free-hand drawing. **Second Term:** Construction of roadbed; laying track; maintenance of way; grading and masonry, with tools, methods and designs in use; explosives and their use; staking out work; laying off frogs, switches, yards and track systems; grades and curves; general regulations and orders; special machinery and appliances for clearing heavy wrecks; mechanical and free-hand drawing. **Advanced Course:** Grade lines and curves in reference to rolling stock and operation of the road; details and designs for frogs, switches, yard systems, crossings, signals and gates; complicated track systems and methods of shortening up leads; designs for culverts and masonry structures; economy in grading and track work; tunnel work, methods and appliances; rock machinery and properties of high explosives; designing.

Department of Buildings.—Regular Course, First Term: Elementary bookkeeping; department reports and accounts; general description of railroads, their equipment and management; practical mechanics, movement of heavy bodies and hoisting machinery, clearing wrecks; properties of materials; building mechanics and building trades; general description of railroad buildings and structures, with illustrations; mechanical and free-hand drawing. **Second Term:** Structural details; bills of material, estimates; designing details; manufacture of building materials; laying off work; erection of buildings and structures; building laws; elements of theoretical mechanics and physics; ornamental work and designs; mechanical and free-hand drawing. **Advanced Course:** General construction and details of railroad buildings and structures; calculation of strength for minor parts; the chemical and physical properties of building materials for strength, durability, inspection and testing purposes; theory of hoisting machinery; artistic ornamentation; designing; free-hand drawing and coloring.

Department of Bridges: Regular Course, First Term: Elementary bookkeeping; department reports and accounts; general description of railroads, their equipment and management; practical mechanics; movement of heavy bodies and hoisting machinery, clearing wrecks; properties of materials; general description of bridges and trestles, with illustrations; mechanical and free-hand drawing. **Second Term:** Wooden and iron bridge details; bills of material, estimates of weight; designing details; manufacture of iron and steel; shopwork on bridges; erection of bridges; tests of materials; elements of theoretical mechanics and physics; special machinery and appliances for moving heavy bridges; mechanical and free-hand drawing. **Advanced Course:** General construction of bridges and details; theoretical mechanics applied to calculation of minor structures for strength and material distribution; the chemical and physical properties of bridge materials; the duties of bridge foremen and inspectors; maintenance of bridges; complicated bridge erection; theory of hoisting machinery; designing; history of bridge constructions.

Master Car Painters' Annual Convention.

The thirty-first annual convention of the Master Car Painters' Association was held at Detroit on Sept. 11, 12, 13 and 14. An address of welcome was given by Mayor Maybury. About 125 members were present. The Secretary's report showed the association to be making good progress, 23 new members having been enrolled since last convention. The election of officers for the ensuing year resulted as follows:

President, A. J. Bruning (L. & N.), Evansville, Ind.; First Vice-President, A. P. Lane (B. & M.), Boston; Second Vice-President, W. C. Fitch (Southern Pacific), San Francisco; Secretary and Treasurer, Robert McKeon (Erie), Kent, Ohio.

The first paper was on "Railroad Hygiene; Its Costs and Compensation," by G. P. Conn, M.D., of Concord, N. H. Dr. Conn said the inside of a coach should receive more attention than the outside. People are obliged to live within a coach, but the outside is only to look at. The internal condition of the passenger car depends on the good sense and the faithful work of the cleaners. A good housewife will work hard to maintain neat and healthful conditions in the living rooms, though the outside of the dwelling may be in need of paint. In obeying the laws of health one may furnish an object lesson for

all good people to follow. Very few roads have a well-organized department for cleaning and disinfecting passenger cars. The disinfectant in use in many cars and stations has a strong, pungent odor, and conceals the existence of some other odor that may or may not contain the germs of disease. Absolute cleanliness of every part of the interior of the car is all that is necessary; clean floors, clean closets and windows, and upholstery free from dust and dampness, represent more of the real conditions conducive to health and comfort than a lot of soap and powders left in closets or put in water used in wiping over the inside of a coach. Brain as well as muscle is necessary to organize and direct car cleaners.

The next question was the best method of conducting tests to determine the relative merits of materials used in painting cars. The committee, F. L. Ball (P. R. R.) and C. E. Copp (B. & M.), presented papers. The test of endurance in painting is the length and nature of service. Tests on panels exposed on shop walls show nothing. Tests are best made on the same car, beginning at the center and continuing around to center on the other side with one color or varnish, then the other half treated likewise. Of course, a long time is required to reach a decision. Tests in one section of the country will not always result as in another section. The action of smoke and gases in passing through tunnels, or the sand and salt air on the seacoast may cause differences. The painter has to use his five senses—smell, sight, feeling, hearing and taste together, and add common sense. He will feel under the brush how a paint or varnish works better than any one can describe it; he can feel grit in his putty and paint; he can taste linseed oil for its purity, and by smell he can detect fish oil or animal oil if he warms it by rubbing briskly between the palms of his hands. You may smell benzine in paint and varnish.

The third question was the best method of painting locomotives. The paper, by Chris Clark (N. Y. C. & St. L.), advocated an oil paint, two coats, and the numbers and initial panels which were made to be removed should be finished with varnish. This produces a great saving both in time and material.

W. M. Joyce, of the Baldwin Locomotive Works, said their method, where they were painting from 90 to 100 engines a month, was: First day, clean and prime; second day, putty and fill; third day, rub down and one coat of color; fourth day, second coat of color, stripe and varnish; fifth day, finish coat of varnish.

To keep the locomotive in good condition while in service, he would use an oil cleaner. A discussion brought out the fact that this was being used on many roads, and the Brooks cleaner was found to be a good article.

The fourth question was the "Best Method and Material for Hardwood Car Interiors." Mr. J. T. McCracken said the wood should be faultless as to finish, and a good paste filler used; sand paper well, and give four coats of varnish; then rub down with pumice stone and water, polishing up with linseed oil and rotten stone. C. A. Bruyere (Canada Atlantic) gave his method, which was similar to Mr. McCracken's, but he left his car interiors in gloss, believing that they cleaned up better, although the work was not done any cheaper, as more sand papering was required, and greater care had to be taken from the foundation up.

Samuel Brown (N. Y., N. H. & H.) read a paper on the progress being made in the painting department.

On the subject of terminal cleaning, papers were presented by J. A. Gohen (C., C. & St. L.), B. E. Miller (L. V.), and A. R. Lynch (P., C. & St. L.). These entered fully into the subject, but after a lengthy discussion none of the present methods were fully endorsed, some advocating the emulsion oil cleaner, while others objected to the great cost of cleaning with it. The question was considered of so much importance that it was laid over for further consideration.

"Can a New Wood Headlining Be Prepared so as to Prevent Decay of Filler, Grain Raising, Etc.?" W. H. Lutton (L. V.) read a valuable paper, showing that there was no reason why a wood lining should not give as good service as any other portion of the inside finish. It should be finished in the same way as any other hard wood, if the wood is properly finished and seasoned. All vegetable fillers, he said, were deficient in retaining properties, and they shrink sooner or later, and as the filler shrinks the varnish drops off with it, leaving a depression at each pore. He advocates a mineral filler (which is in general use in all car shops), well brushed in, and left 36 to 48 hours to dry; then coated with pure alcohol, shellac, and finished with finishing varnish. Linings finished ten years ago are to-day bright and intact on the Lehigh. They have been regularly varnished and looked after, a matter of the first moment when the durability of a filler is considered.

The eighth subject was "Burning Off of Old Paint." Robert Shore (L., S. & M. S.) said a burnt off car should be traversed; a car that is cracked and not traversed will in time show the old cracks.

J. A. P. Glass (Y. & M. V.) never had any trouble; would prefer a burnt-off surface to paint on rather than new sheathing.

The claim is made that burning is injurious to future painting, but a number of members testified to the contrary. Two years ago a dining car was partially burnt off, and new siding put on the balance, and no difference is noticed to-day. Mr. Block (C., C. & St. L.) would prefer to burn-off a car rather than re-sheath it, if the siding is in good condition. The Pullman people do not burn-off when the paint is badly cracked, but remove the siding; this is done so as to be sure the framing is not loose; but they would get just as good results as far

as the painting is concerned if they would burn-off the car.

"Uniform System of Stencilling Freight Cars." Mr. J. H. Kahler (Erie), in a paper, said that this could be brought about by grouping the lettering which concerns trainmen, tally men and car inspectors, placing the lettering near the bottom of the car, with the number on same side and in center, with the name of the road in full directly underneath the number, in small letters; the initials and trade-marks to be placed on the other side of center of car; use 8 in. to 12 in. letters and figures for initials; the small stencilling should be 1½ in. to 2½ in. letters and figures. All letters and figures should be of a given style and size, when all shops could be supplied with stencils, which could be used on foreign cars as well as on their own. He recommended that the question be presented to the Master Car Builders, showing them how a great saving can be made by standardizing. A discussion resulted in referring the matter to the Master Car Builders. Blue prints and styles of letter will be prepared.

"Records and Accounts." W. T. Canan (P. R. R.) read a paper, showing the plan in use by him. A discussion followed, which brought out the various plans followed. Nothing definite was arrived at, but it was generally agreed that there could be great improvement made in the majority of shops in this respect.

The query list and questions made an interesting part of the closing session, and brought out valuable information. Several of these were referred to the Advisory Board as being worthy of consideration as regular subjects for next convention.

After the usual resolutions were offered, a vote of the convention resulted in the choice of Buffalo, N. Y., for the convention of 1901.

Eastern Maintenance of Way Association Meeting.

The eighteenth annual meeting of the Eastern Maintenance of Way Association was held at the Grand Union Hotel, Saratoga Springs, N. Y., Sept. 19, 20 and 21.

The first session was called to order Wednesday morning at 10 o'clock, with President Haskell in the chair. The report of the Secretary and Treasurer was read and approved, and officers elected as follows: President, F. E. Sibley, New York, New Haven & Hartford; Vice-President, L. Curtis, Boston & Maine; Secretary and Treasurer, F. C. Stowell. Executive Committee: J. W. McManama, Fitchburg; T. J. Sullivan, Boston & Albany; G. A. Demore, New York, New Haven & Hartford, and R. P. Collins, of the New York, New Haven & Hartford.

The following papers were presented and discussed Wednesday: "The Best Method of Constructing and Maintaining Public and Private Crossings at Grade," by a committee consisting of Henry Ware, B. R. & P. R. R. (Chairman); J. L. Shanks, Fitchburg R. R., and R. A. McQuaid, B. & A. R. R.; "To What Extent Should Landscape Gardening Be Applied to Maintenance of Way Work?" by L. Curtis, B. & M. R. R., and "Recent Improvements in Handling Snow; What Has Been the Result of Equipping Locomotives With Any of the So-Called Snow-Flanging Devices? Would It Be Advisable to Maintain Such Equipment for Light Flanging, or, Economy and Efficiency Considered, Would the Regular Heavy Plows Best Be Used for All Snow Work?" by A. C. Stickney, B. & M. R. R. (Chairman); C. S. Osgood, N. Y., N. H. & H. R. R., and A. J. Logan, M. C. R. R. An abstract of Mr. Curtis' paper follows.

In his paper Mr. Curtis speaks from a layman's point of view, claiming no technical knowledge of the art of a landscape gardener. In making plans for new stations, Mr. Curtis advises that as much care be given to the location of the trees, shrubs or bedding plants and the varieties to be used, and the grading done, so as to give a proper depth of fertile soil where needed. He considers the appearance of the station grounds as more attractive to the traveling public than the interior of the station. He considers a well-kept lawn, with a proper arrangement of shrubs and other hardy plants, always beautiful. Tender bedding plants produce a good effect for a few months. In the vicinity of Boston they cannot be safely put out until early in June. It is a month before they make a good appearance, and usually they are killed early in September by frost. During the remaining months of the year there is nothing but unsightly piles of earth. Hardy shrubs, if properly selected, are ornamental every month in the year and in winter, when coated with ice and snow are especially attractive. They also cost little, especially if propagated by the railroad. The work of the landscape gardener, however, should not stop at the station. All grounds near the station should be made to correspond with those in the immediate vicinity. Banks should be properly sloped, depressions filled, large boulders, where dangerous, removed, small ones buried or neatly piled, and all useless material disposed of in the cheapest manner possible. Unsightly walls, fences, large boulders, etc., can, at little expense, be covered with ornamental vines. The Virginia creeper is excellent for this purpose. It is hardy, adapted to a great variety of soils, and is easily propagated. It is ornamental during its entire season of growth, particularly in early autumn, when its leaves change to brilliant colors. The Boston ivy can be used with good effect to cover brick or stone walls adjacent to the tracks. In many cases hedges of barberry, California privet or honey locust could be used instead of fences. The plants could be propagated by the railroads in nurseries of their own at small expense, and

the cost of planting would not be much more than for building ordinary fences. The hedges would be durable, ornamental and effective. It would not only serve the ordinary purposes of a location fence, but in many places would prevent the snow drifting over the tracks. Mr. Curtis is aware that the beautifying of grounds entails additional expense, but holds that the amount would be small provided the work be done systematically. Much can be accomplished by section men late in the fall, or early in the spring, when there is but little track work that can be done. Mr. Curtis finds it easy to interest the average section foreman in this kind of work. He needs encouragement and advice, but after he has made a beginning and has had an opportunity to observe the improvements that are being made by his neighbors the spirit of competition begins to develop, and its influence is soon noticeable over the entire line.

The other subjects discussed during the convention were: A paper by R. P. Collins, N. Y., N. H. & H. R. R., on "The Best Method of Training Section Men for Foremen;" committee report on "Are Flangeless Driving Wheels on Locomotives Desirable?" by M. C. Hamilton, N. Y., N. H. & H. R. R. (Chairman); E. H. Bryant, N. Y., N. H. & H. R. R., and J. W. Shanks, N. Y., N. H. & H. R. R.; paper by Walter G. Berg, Chief Engineer, L. V. R. R., on "The Education of Railroad Men for the Subordinate Ranks of the Maintenance of Way Service," and a committee report (continued from 1899) on "From a Maintenance of Way Standpoint, the Consideration of the Relative Merits of Stone Ballast and Gravel Sprinkled With Oil," by G. L. R. French, B. & M. R. R.; C. B. Lentell, B. & A. R. R., and G. A. DeMore, N. Y., N. H. & H. R. R. Mr. Lentell submitted a minority report.

An abstract of Mr. Berg's paper appears on another page.

EXHIBITS.

The exhibits are placed near the entrance to the place of meeting—the club room of the Grand Union. The following were in place at time of going to press:

Bonzano Rail Joint Co., Philadelphia.—Models of the Bonzano rail joint.

Buda Foundry & Mfg. Co., Harvey, Ill.—Samples of the Ware tie plate gage and the Paulus, Buda and Wilson track drills.

Continuous Rail Joint Co. of America, Newark, N. J.—Several sections of track showing application of the continuous joint.

Diamond State Steel Co., Wilmington.—Self-locking switch stand, rail joint spring nuts, diamond and crescent pointed spikes and section of Churchill rail joint.

Dilworth, Porter & Co., Pittsburgh, Pa.—The Goldie Perfect Point spike, in soft steel; the Glendon tie plate and the Goldie shoulder claw tie plate.

Fox Brothers & Co., New York.—Single and double Hartley and Teeter light inspection cars.

William Goldie, Jr., & Co., Pittsburgh, Pa.—Samples of the Goldie tie plug.

W. H. Morse, Somerville, Mass.—Ratchet wrench for use on steam and electric railroads, bridges and all structural work.

National Lock Washer Co., Newark.—Samples of National lock washers.

Page Woven Wire Fence Co., Adrian, Mich.—A model showing a section of the Page fence. An attachment to the model demonstrated the difference in tension between straight wire and the twisted wire used in the Page fence.

Pennsylvania Steel Co., Steelton, Pa.—Model of split switch with switch standing.

Ramapo Iron Works, Hillburn, N. Y.—Model of the Ramapo switch and stand.

The Roberts Car & Wheel Co., Three Rivers, Mich.—Full size models of the Roberts hand, push and velocipede cars.

Ruffner & Son, Philadelphia, Pa.—Samples of the Eureka double and single nut locks and tie plates and guard rail brace combined.

United States Wood Preserving Co., of New York.—Samples of wood treated by their process.

Weber Railway Joint Mfg. Co., New York, N. Y.—Full size models of Weber standard, step and insulated joints applied to sections of track.

A Heavy Cut-Off Saw.

The engraving shows a heavy railroad cut-off saw recently put on the market by the S. A. Woods Machine Co., of South Boston, Mass. This will cut timber 14 in. x 16 in., or boards 30 in. wide; and carry saws up to 40 in. diam. It is a heavy, rigid, and powerful machine.

Some of the Awards at Paris.

We give below a list of the awards made at the Paris Fair to American exhibitors, including in this list only such as seem to us likely to be of special interest to our readers. Undoubtedly there are errors and omissions, although we have tried to collate and check three different lists. The French reports that have come to us make wretched work with the American names.

We have recently received from the Director of Liberal Arts and Chemical Industries, United States Commission, information that "in accordance with the official announcement a grand prize was bestowed upon the exhibit of United States journals, publications and periodicals, and you are therefore entitled to use this award of grand prize." We judge from this that a considerable percentage of the newspapers and magazines published in the United States will be able to say that they have received the grand prize. We hardly feel justified, however, in claiming this distinction, but shall content ourselves with our modest silver medal.

CLASS 32—"MATERIAL OF RAILROADS AND TRAMWAYS."

Grand Prize.

United States Railway Mail Service.
The Baldwin Locomotive Works.
The Pressed Steel Car Co.
J. G. Brill Co.
Westinghouse Air-Brake Co.

Gold Medal.

The American Railway Association.
Master Car Builders' Association.
The American Railway Master Mechanics' Association.
Gould Coupler Co.
The McConway & Torley Co.
The International Pneumatic Railway Signal Co.
Standard Steel Works.

Silver Medal.

The Railroad Gazette.
The Railway Age.
Engineering Record.
Western Society of Engineers.
Street Railway Publishing Co.
Ashcroft Mfg. Co.
Crosby Steam Gage & Valve Co.
Diamond State Steel Co.
The International Brake-Shoe Co.
United States Metallic Packing Co.
Fairbanks, Morse & Co.
Galena Oil Co.
Goodwin Car Co.
Peckham Truck Co.

Bronze Medal.

American Locomotive Sander Co.
American Railway Publishing Co.
McKee, Fuller & Co.
Weber Railway Joint Mfg. Co.
Bonzano Rail Joint Co.
Christensen Engineering Co.

In this class, as elsewhere throughout the exhibition, certain individuals get awards for "collaboration" in the exhibits which have also received awards under their respective heads. Thus the following gentlemen have special awards for collaboration:

Gold Medal.

S. Vauchain, Baldwin Locomotive Works.
W. F. Richards, Gould Coupler Co.
H. C. Buhoup, McConway & Torley Co.
C. T. Schoen, Pressed Steel Car Co.

Silver Medal.

E. C. Thurber, Galena Oil Co.
W. D. Sargent, International Brake Shoe Co.
E. A. Schoen, Pressed Steel Car Co.
J. M. Hanson, Pressed Steel Car Co.

Bronze Medal.

J. C. Davis, International Brake-Shoe Co.

CLASS 28—"MATERIALS AND PROCESSES IN CIVIL ENGINEERING."

Grand Prize.

U. S. Government for the Mississippi River Commission.
Geo. A. Fuller Co. (Steel frame building models, etc.).

Silver Medal.

Ingersoll-Sergeant Drill Co.
Rand Drill Co.
The Bucyrus Co.
Standard Paint Co.

In Collaboration—Gold Medal.

A. Hilder & Nolly, Mississippi River Commission.
George A. Fuller.
C. T. Purdy (with Geo. A. Fuller's exhibit).

CLASS 29—"PLANS AND DRAWINGS FOR PUBLIC WORKS."

Grand Prize.

American Society of Civil Engineers.
U. S. Government Mississippi River Commission.
Phoenix Bridge Co.
Chicago Sanitary District.
Boston Transit Commission.
Boston Terminal Co.

Silver Medal.

Ingersoll-Sergeant Drill Co.
Rand Drill Co.
The Bucyrus Co.
Standard Paint Co.

In Collaboration—Gold Medal.

A. Hilder & Nolly, Mississippi River Commission.
George A. Fuller.
C. T. Purdy (with Geo. A. Fuller's exhibit).

CLASS 29—"PLANS AND DRAWINGS FOR PUBLIC WORKS."

Grand Prize.

American Society of Civil Engineers.
U. S. Government Mississippi River Commission.
Phoenix Bridge Co.
Chicago Sanitary District.
Boston Transit Commission.
Boston Terminal Co.

Silver Medal.

Ingersoll-Sergeant Drill Co.
Rand Drill Co.
The Bucyrus Co.
Standard Paint Co.

In Collaboration—Gold Medal.

A. Hilder & Nolly, Mississippi River Commission.
George A. Fuller.
C. T. Purdy (with Geo. A. Fuller's exhibit).

CLASS 29—"PLANS AND DRAWINGS FOR PUBLIC WORKS."

Grand Prize.

American Society of Civil Engineers.
U. S. Government Mississippi River Commission.
Phoenix Bridge Co.
Chicago Sanitary District.
Boston Transit Commission.
Boston Terminal Co.

Silver Medal.

Ingersoll-Sergeant Drill Co.
Rand Drill Co.
The Bucyrus Co.
Standard Paint Co.

In Collaboration—Gold Medal.

A. Hilder & Nolly, Mississippi River Commission.
George A. Fuller.
C. T. Purdy (with Geo. A. Fuller's exhibit).

Howard Carson (exhibit of Boston Transit Commission).
George B. Francis (exhibit of the Boston Terminal Co.).
Isham Randolph (exhibit of Chicago Sanitary District).
George S. Morison (exhibit of the Kansas City, Memphis & Birmingham).
Cass Gilbert (exhibit of George A. Fuller & Co.).
F. P. Stearns (exhibit of the Metropolitan Water Board, Boston).

Silver Medal.

H. C. Ripley and George Y. Wisner (Arkansas River Board).
W. S. Allen (exhibit of Boston Terminal Co.).

DEPARTMENT OF LIBERAL ARTS AND CHEMICAL INDUSTRIES.

Grand Prize.

American Steel & Wire Co.

Gold Medal.

Brown & Sharpe Mfg. Co.
Ferracute Machine Co.
Valentine & Co.

Silver Medal.

Oberlin Smith (Ferracute Machine Co.).

Bronze Medal.

Harry Janvier and William Ware (Ferracute Machine Co.).

DEPARTMENT OF MACHINERY AND ELECTRICITY.

Not Competing.

Adams-Bagnall Co.
General Electric Co.
Standard Tool Co.

Grand Prize.

American Steel & Wire Co.
Westinghouse Electric & Mfg. Co.
Worthington Pumping Engine Co.
Otis Elevator Co.
Brown & Sharpe Mfg. Co.
The Pratt & Whitney Co.
E. W. Bliss Co.
Niles Tool Works Co.
J. A. Fay & Egan Co.
John A. Roebling's Sons Co.

Gold Medal.

Simonds Mfg. Co.
Chicago Pneumatic Tool Co.
Morse Twist Drill & Machine Co.
Cincinnati Milling Machine Co.
Hendy Machine Co.
Warner & Swasey.
Norton Emery Wheel Co.
Bement-Miles Co.
Gisholt Machine Co.
Jones & Lamson Machine Co.
Bullard Machine Tool Co.
Pond Machine Co.
Bullock Electric Mfg. Co.
Tinius Olsen & Co.
Rand Drill Co.
Crane Co. (Chicago).
Ingersoll-Sergeant Drill Co.
Shaw Electric Crane Co.
William Sellers Co.

Silver Medal.

Ferracute Machine Co.
Cleveland Twist Drill Co.
Q. & C. Co. (Chicago).
Valworth Mfg. Co.
Becker-Brainerd Milling Machine Co.
Gould & Eberhardt.
Robins Conveying Belt Co.
Lunkenheimer Co.
Monarch Governor & Machine Co.
Crocker-Wheeler Electric Co.
Shaw Electric Crane Co.
Crane Co.
Ashton Valve Co.
Mietz & Weiss.

Bronze Medal.

Bickford Drill & Tool Co.
Standard Pneumatic Tool Co.
Crane Co.
Safety Emery Wheel Co.
Geometric Drill Co.
Builders' Iron Foundry.
Westcott Chuck Co.
American Tool & Machinery Co.
Pratt Chuck Co.
Armstrong Brothers Tool Co.
Farr Telephone & Supply Co.
Sprague Electric Co.
Stow Mfg. Co.
Standard Paint Co.
American Steam Gage Co.
Taunton Locomotive Mfg. Co.
Ashton Valve Co.
Jeffrey Mfg. Co.
Stillwell-Bierce & Smith-Valle Co.

Honorable Mention.

W. H. Nicholson & Co. (Wilkesbarre, Pa.).
American Tool & Machinery Co.
Gold Car Heating Co.
Gordon Battery Co.
Ingersoll-Sergeant Drill Co.
Sherwood Mfg. Co.
U. S. Metallic Packing Co.
H. W. Johns Mfg. Co.

CIVIL ENGINEERING AND TRANSPORTATION.

Grand Prize and Gold Medal.

Southern Ry. Co., Washington, D. C.

DEPARTMENT OF FORESTRY AND FISHERIES.

Grand Prize and Silver Medal.

Southern Ry. Co.

Gold Medal.

E. D. Albro Co.

MINING AND METALLURGY.

Grand Prize.

American Steel & Wire Co.
Ingersoll-Sergeant Drill Co.
Lehigh Valley Coal Co.
Robbins Conveying Belt Co.

Gold Medal.

Iron Age Publishing Co.
Jeffrey Mfg. Co.
Rand Drill Co.

DEPARTMENT OF VARIED INDUSTRIES.

Gold Medal.

Brown & Sharpe.

Silver Medal.

Powers Regulator Co.

DEPARTMENT OF SOCIAL ECONOMY.

Gold Medal.

Westinghouse Air-Brake Co.
Pennsylvania Railroad Relief Department.

Silver Medal.

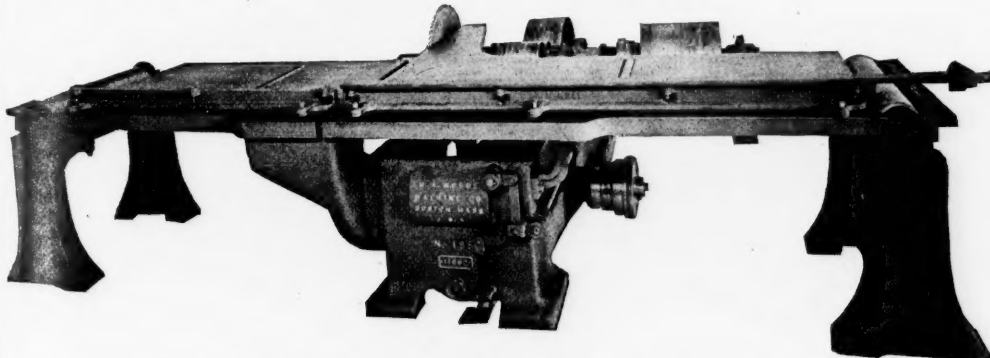
Brotherhood of Locomotive Engineers.
Southern Railway Co.
Baltimore & Ohio Railroad Relief Association.
Chicago & Burlington Railroad Relief Association.
Lehigh Valley Railroad Relief Association.
Pittsburg Western Railroad Relief Association.

Bronze Medal.

Locomotive Engineering.
Pittsburgh Junction Railroad Relief Department.

Honorable Mention.

Atchison, Topeka & Santa Fe Ry.
Engineering News Publishing Co.
Hocking Valley R. R.
Illinois Steel Co.



No. 188, Railroad Cut-off Saw—Self-contained Counter-shaft.

The saw carriage has power feed, with three speeds, controlled by a treadle and has quick automatic return. There is a tension device for keeping the driving belt tight, and a pneumatic pulley on the saw arbor, which prevents air-cushioning of the belt with consequent waste of power.

The arbor may be made long, to permit of the use of a spinning head, and the table may be lengthened, if desired, additional floor stands, each carrying a roll, being supplied on order. The gage is extra heavy, with adjustable stops, which can be quickly set for duplication of work. The stop bar is interchangeable with fences on both sides of the saw. The counter-shaft, which is self-contained, is provided with a patent self-oiling, loose pulley.

Kansas City, Memphis & Birmingham Ry. (Memphis Bridge).

George A. Fuller & Co.
City of San Francisco.
Metropolitan Park Board, Boston.
Metropolitan Sewerage Board, Boston.
Metropolitan Water Board, Boston.
Park Commissioners, Cambridge, Mass.
Street Commissioners, Cambridge, Mass.

Silver Medal.

State Board of Health, Massachusetts.

Honorable Mention.

Smith & Wesson.
Illinois Central R. R. Co.

In Collaboration—Gold Medal.

C. T. Purdy (exhibit of Fuller & Co.).



ESTABLISHED IN APRIL, 1856.
PUBLISHED EVERY FRIDAY
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS

CONTRIBUTIONS—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

ADVERTISEMENTS—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

August gross railroad earnings show continued betterment, but the gains are smaller both in amount and ratio. Returns by *The Chronicle* from 111 companies, comprising 10,122 miles of road, show gross earnings for the month of \$59,840,941, against \$56,380,390 for the corresponding month last year, a gain of \$3,460,551, or 6.14 per cent. Last year the gain was \$6,815,170, or 13.48. In 1898 and 1897 the gains were \$2,297,452 and \$4,971,258, respectively. The gross earnings for the eight months from Jan. 1 this year were \$441,422,175, which was a gain of \$48,080,540 over the corresponding months last year. In the increases of August earnings this year the Northern Pacific leads with \$325,034. The Missouri Pacific gained \$274,210, the Baltimore & Ohio \$241,140, the Norfolk & Western \$236,289, the Chicago, Milwaukee & St. Paul \$217,994, the New York Central \$206,857 and the Chesapeake & Ohio \$200,364. There were 82 roads of the total that reported increases, 29 of which were above the \$30,000 mark. There were 27 roads that showed a falling off of earnings and three of these in excess of \$30,000. These were the Wisconsin Central with a loss of \$62,434, the Louisville & Nashville \$54,369, and the Minneapolis, St. Paul & Sault Ste. Marie \$51,621. Much of this was due to a falling off of corn movement in the West and of cotton movement in the South. The receipts of corn in the Western markets for the five weeks ended Sept. 1 were 13,214,137 bushels against 20,504,874 in 1899. There was a decrease also in oats of 2,000,000 bushels and smaller losses in barley and rye. The wheat movement, however, showed improvement from 20,349,794 bushels last year to 33,210,451 bushels this year. At Chicago for the even month the grain deliveries this year aggregated 24,866,691 bushels, against 28,766,294 bushels a year ago. There was an increase this year in live stock receipts at Chicago to 23,110 carloads from 21,896 last year. The cotton movement, never large in August, was unusually small this year. At the Southern outports the receipts were only 40,807 bales, against 106,511 bales last year. The overland shipments this year were 17,517 bales, against 45,170 bales. The falling off of earnings is mainly in the Northwest, where this year's spring wheat crop is a failure, or in the Middle West, where there is a poor winter wheat crop and manufacturing activity is somewhat diminished, or in the South, due to the smaller cotton crop and the slackening in the iron and steel industries.

The Effect of Temperature on Friction.

Prof. R. A. Smart, of Purdue University, read a paper at the September meeting of the Western Railway Club on the friction of brake-shoes, as shown by experiments on the M. C. B. brake-shoe testing machine at Purdue. Later we shall print

this paper, but at present only the conclusion regarding the effect of temperature on the friction of brake-shoes will be referred to.

This conclusion is that the coefficient of friction of cast-iron brake-shoes is practically constant with variations in temperature of shoe and wheel up to 1,500 degrees Fahr., the limit of temperature attained in the tests. This is found to hold for conditions of constant running through a range of speeds of 40 to 60 miles an hour and with constant normal pressures on the brake-shoe ranging from 2,800 to 6,840 lbs. That is, these are the limits of the experiments. The tests were made by running at a fixed speed with the brake-shoe applied with a constant pressure, taking a continuous record of the tangential pull on the shoe as well as temperature measurements at both ends of the shoe. These conditions correspond to running down a grade at a uniform speed with the brakes applied with a constant pressure. The temperature was measured at the face of the shoe at both ends with small Le Chatelier pyrometers inserted in the shoe, which were in circuit with a galvanometer. It was also found that making a series of emergency stops in quick succession, where the speed varied as well as the temperature, did not furnish any conclusive information as to the effect of temperature on the mean coefficient of friction, and that continuous running tests were necessary in order to eliminate the effect of changes in speed.

It is hardly necessary to say that these experiments are the first which really throw any light on the effect of temperature on friction, and Prof. Smart's conclusion that the friction is not affected by the temperature upsets some theories which have been advanced to explain certain findings in the Galton brake tests and the M. C. B. laboratory tests of brake-shoes. We have never thought that the M. C. B. laboratory tests showed anything about the effect of temperature on friction, and have always been curious as to the outcome of just such tests as have now been reported. In discussing this same subject, Oct. 8, 1897, we said: "From the M. C. B. tests made under conditions corresponding to emergency applications very little can be learned regarding the effect of the element of temperature on the coefficient of friction, as the friction during such a stop is constantly varying, due to other factors, chief of which is the variation in speed." This was roundly criticized at the time by a correspondent who held opposite views, but it seems to be confirmed by recent work at Purdue.

Annual Reports.

Illinois Central.—Like the reports immediately preceding this annual statement, which is for the fiftieth year of the company, is notable for the expansion of the system which it records. In the past year, the company has taken over for operation the new Omaha Division of 131 miles; the St. Louis, Indianapolis & Eastern, 88½ miles; the St. Louis, Peoria & Northern into East St. Louis, 98 miles; and other smaller roads, so that on June 30 last, it operated 3,996 miles, or 317 miles more than on the same date in 1899. These figures are exclusive of the 1,000 miles operated by the Yazoo & Mississippi Valley Railroad, in which the Illinois Central owns practically all the outstanding stock and bonds. This expansion of mileage is still going on, the Peoria, Decatur & Evansville, in Indiana, having been taken over for operation since the close of the fiscal year. In 1895, when this expansion of the Illinois Central may be said to have begun, the company operated 2,880 miles and earned gross of \$19,056,994, an average of \$6,599 per mile of road. In 1900, on an average of 3,845 miles, gross earnings were \$32,611,967, or \$8,482 per mile, which is in excess of the average gross receipts per mile of all the roads in the United States, and also above the total of any of the large systems operating in the same section as the Illinois Central. The Chicago & Northwestern earned \$8,230 gross per mile in its 1900 fiscal year ending May 31 last.

This expansion of revenue has resulted, despite materially enlarged charges for maintenance of the property, in a substantial growth in net revenue, so that the company for the past year was able to place its capital stock, which is now \$60,000,000, against \$50,000,000 in 1895, on a 6 per cent. dividend basis, 5 per cent. having been paid regularly without interruption for ten years. Gross receipts, with an increase of 4¾ per cent. in the miles operated, increased 16 per cent. and net receipts from traffic increased 14 per cent., while the balance available for fixed charges increased 9 per cent. The actual surplus available for dividends was \$5,757,000, equal to 9½ per cent. on the total stock. Practically the whole of the balance after dividends was appropriated to a special betterment fund, following the practices in previous years. In 1900, this appropriation was \$2,416,674, in 1898 \$1,475,040, and in 1895 \$839,000.

This amount, however, was only about half the total betterment expenditures in the year. These amounted to \$4,265,619. Besides the charges against income mentioned above, \$891,889 of this was appropriated from the Louisville division fund and \$957,056 was charged

against capital. Most of the appropriation from the year's income was for new equipment and included 33 locomotives, costing \$423,950; 15 day coaches and 25 other passenger cars, besides 1,953 40-ton cars costing \$1,530,000. The whole charge for additional equipment was \$2,412,825. Of the expenditures for roadway betterments, the largest item was \$739,258 for reducing and raising grades. Other large items were \$366,948 for new sidings, \$196,262 for station grounds, and \$135,919 for new buildings.

Both in the text of the report and in special tables, the increasing capacity of equipment is brought out. It is stated, for instance, that the 14 locomotives, built in the year to replace vacant numbers, will haul more tonnage than could 38 of the type which they replaced. The increase in the tonnage capacity of freight cars in 1900 (129,440) was greater than the total carrying capacity of all the freight cars owned in 1886. The 50 additional locomotives acquired during the year (17 being through new lines taken over) represented an addition to the number owned of 6½ per cent., but the tractive power was increased by 10 per cent.; the freight car inventory increased in number by 10 per cent., but the tonnage capacity of the equipment by 17 per cent.

Chesapeake & Ohio.—During the year covered by the 1900 annual report just issued, the control of this company has been changed in an interesting way. Early in the calendar year, the Pennsylvania railroad made large purchases in the stock. This was essential to the Pennsylvania's plan of securing stability in the soft coal trade, for the Chesapeake & Ohio tonnage in that freight has been heavily increased in recent years, and by means which have brought about sharp declines in the rate. In other respects, however, the Chesapeake & Ohio was in a peculiar situation, for there was a large individual Vanderbilt interest in the property, and under Mr. Ingalls' presidency of ten years, the road had been developed as an Eastern connection, chiefly in grain tonnage, of the Big Four Company. It was necessary for the Vanderbilt interests to preserve this connection, and the joint control of this property seems to have been the first practical result of the new understanding between the New York Central and the Pennsylvania. The Chesapeake & Ohio, therefore, while retaining its autonomous existence is controlled by the Pennsylvania on the one side and by the New York Central, the Lake Shore, and the Cleveland, Cincinnati, Chicago & St. Louis on the other.

President Ingalls, who retired from his office soon after the new interests had purchased into the property, surrendered its management when the rehabilitation of its fortunes, which were at the lowest ebb when he assumed the administration in 1888 at the time of the last reorganization, may be considered as having been fully accomplished and the future of the property assured even as an independent line. During the past year, the company paid its first dividend on \$60,527,800 of common stock out of the earnings of the 1899 fiscal year. It was only since 1897 that the Chesapeake & Ohio has shown a surplus over charges sufficient to pay a dividend, but this has been due in part to the appropriation of earnings to the betterment of the property. Gross earnings, however, have increased steadily in each of the past ten years, except in 1894. Comparing with 1891, freight earnings have increased over 70 per cent., being \$10,095,144 in 1900, against \$5,963,516 in the earlier year, total gross receipts being \$13,402,070 in 1900, against \$8,127,111 in 1891.

This expansion has been sufficient to show continuous increases in the yearly balance over fixed charges, despite the steady increases in interest from the sales of bonds which were required because enough earnings were not available to carry out the improvements made. How extensive these have been may be shown by references in the present report without going any further back. On work now under way, for instance, the company has expended \$2,948,443, while it will require a further estimated expenditure of \$2,279,941, to complete the improvements in progress, not counting \$949,200 required in extensions. The main betterment items include 50 miles of additional second track costing \$1,250,000, of which thirty miles at a cost of \$745,236 has been completed. A grain elevator, piers and yards at Newport News cost \$644,536; the purchase of the Coastwise Steamship Company securities \$732,111; and branch roads, \$507,000, about \$422,000 additional being needed to complete these lines. The most extensive improvement under way, however, consists of the new terminals at Richmond, which include an elevated line through the city, a new passenger station, etc., as already described in these columns. Besides \$214,148 expended prior to 1899 in real estate, \$247,216 was spent for work carried out last year, leaving \$1,252,784 as the amount estimated necessary to complete the work.

Besides these special charges for betterments, maintenance expenses have been constantly enlarged to provide for renewals. The increase last year, for instance, in maintenance of way was \$252,000, and in maintenance of equipment \$201,000. The latter account includes \$407,369 for five new locomotives and 647 new freight cars for replacements. A statement of betterments shows an expenditure of \$441,002, of which the largest amount, \$143,713, for permanent bridges. New yards cost \$118,063, and sidings \$74,099, all these amounts being included in operating expenses. Besides the equipment for replacements mentioned above, the company purchased last year and charged to income balance \$338,372 for 20 locomotives, 8 passenger cars and one dining car and additional real estate costing \$10,323.

Reference to Chesapeake & Ohio's operations would be incomplete without giving information as to the train operations and the rates. These, as for many successive years, have broken their previous "records." That is to say, the car and trainloads were never so high, and the rates never so low, as in the past year. The average carload is now reported 21 tons per loaded cars, and the average trainloads is at the remarkable figures of 485 tons, an increase of 63 tons over 1899, 108 tons over 1898, and 133 tons over 1897.

The average ton-mile revenue on coal was 2.02 mills, against 2.74 mills in the previous year. Ton-mile revenue on general freight rose from 4.37 mills to 4.56 mills. President Stevens, who has controlled the operating department for nearly 10 years, during which the company's remarkable transportation results have been accomplished, has special reason for satisfaction in this record. Mr. Stevens points out that in 1900 there was an increase of about 20 per cent. in the tonnage moved and a decrease of over 5 per cent. in the revenue per ton-mile, the latter having reached the low figure of 3.43 mills per ton-mile. Notwithstanding this extremely low rate, freight trains earned \$1.67 per mile run, an increase of 8.5 per cent., as compared with the previous year, due to the better loading of cars and larger trains. The average tons of revenue freight per train was 488 tons, an increase of 14.8 per cent., as compared with the previous year.

New York, Ontario & Western.—The gross receipts for the New York, Ontario and Western in the year ending June 30, exceeded \$10,000 a mile, and the net \$3,000 a mile, for the first time in the company's history. The actual figures were \$10,331 and \$3,223 respectively, against \$9,046 and \$2,864 in 1899, those figures being then the highest ever reported. In 1887, gross receipts were only \$4,048 a mile, and in 1890, were \$5,188 a mile; so that the gross earning power of the company has practically doubled in ten years. Net, however, has done considerably better than this, comparing with \$1,020 in 1890, so that this figure has more than trebled in the decade. This development of earning power is attributable greatly to the building of the Scranton Division opened in 1890. But the increase of local business has been important, and this phase of the company's business is interesting, because it has been able to develop two special classes of traffic, the carriage of milk and the summer tourist travel.

In the past year anthracite coal business accounted for \$300,000 of the gain in total revenue, and for \$257,000 of that in 1899, the rate of increase being over 15 per cent. in each year. There has been a special cause for the improvement in the coal freight revenues of the Ontario & Western, aside from the growth consequent upon trade activity. In 1899 the company secured control of the coal lands formerly owned by the Lackawanna Iron & Steel Company, near Scranton, the purchase calling for the raising of approximately \$4,000,000 of new capital. In the past year, the coal tonnage secured from these lands is reported as having been 610,284 tons. The mines were worked profitably enough to meet all maturing notes issued by the railroad for their purchase and to reduce the second mortgage to some extent.

Surplus earnings, however, even though they have more than doubled in two years, rising from \$402,460 in 1898 to \$859,024 last year, cannot be considered as large relatively to the volume of the stock outstanding, \$58,114,000. Yet those shares on which no dividend has ever been paid, are on a road having a terminal at New York and represent capital invested in the road, and are not bonus shares. It is just twenty-seven years ago this week that the old New York & Oswego Midland became bankrupt, soon after its completion as a through line was announced. In the reorganization which followed, the present common stock was issued in exchange for the old first and second mortgage bonds and the stock, the two latter security issues receiving the new stock for their assessments of 20 per cent. and 30 per cent. respectively.

To obtain even the surplus balances which have been shown, has required not only careful management, but the supply of large amounts of new capital since the reorganization of 1879, and the investment in the property of all the income earned over charges. A summary in the present report, giving the company's receipts and disbursements between Oct. 1, 1885, and June 30 last, shows that besides \$46,917,251 received as operating revenue, \$13,303,000 was obtained by the sale of bonds, \$2,500,000 by the issue of gold 5 per cent. notes on the Scranton coal purchase above referred to. The expenditures included \$2,164,515 for rentals of leased lines, \$10,705,582 for improvements and additions to line, and \$7,169,567 for investments in other companies. The unexpended balance on hand is \$143,199 out of an income aggregating \$64,519,114, none of which was paid out in dividends, although the stock represents actual capital put in the property. When railroad prosperity is so much discussed as at present, a statement like this is opportune as showing conditions which are often overlooked.

The trainload, which has made steady progress for years past, is now 287 tons, against 276 tons in 1899, and 132 tons in 1890, pushing and assisting engines, mileage being counted as train miles. In the past year ton-miles increased 10½ per cent., car miles 6½ per cent., and the train miles 6½ per cent. New 90-ton engines now in service are expected to save considerable train mileage, as they will haul 900 tons of freight on 70 ft. grades, as against 530 tons by the present standard engine.

Injunctions Against Trade Unions in England.

The financial liability of a trade union for unlawful acts committed in connection with strikes, is the subject of an interesting judicial decision in England. It is not certain that this decision will be of any immediate interest in this country, for here it is still true, in nearly every case, that trade unions have no financial responsibility and therefore cannot be punished by the courts. "Brotherhoods have no money and corporations have no souls." This one great and immovable obstacle to the use of legal remedies for strikes continues as great as ever. Nevertheless the English decision is a significant item of news. It is by Mr. Justice Farwell. *Herapath's Journal* says:

The Taff Vale strike has done some good at any rate. It has given us one of the most important decisions of recent years on trades union liability. Up to now, the accepted notion has been that the agents of a trades union could go about and incite to, or do, a number of acts against employers without any liability, except as against the individual, generally a man of straw, or of limited means. Mr. Justice Farwell has now laid down that a trades union can be sued in its corporate capacity for the acts of its servants just as much as any other corporation or private individual could. The injunction was against picketing at the Great Western Railway station at Cardiff. It is a considered judgment and will take a lot of beating in the superior courts if the case be taken there. He founded his conclusions on law and on principle. The Trades Union Acts of 1871-76 legalized trades unions and authorized them to hold property in a corporate capacity, and the general principle of English law is that a corporation so endowed is liable in person and in pocket for the acts of its servants. This will put a damper on the gentlemen who sit in the background brewing mischief whilst others do the dirty work. The pocket is a vital part with most people, and the funds of the society would be liable for any acts done or instigated by the agents of the society. The union men may strike but they must not incite others to strike, or intimidate men who are willing to work. The abolition of the old doctrine of conspiracy as applied to picketing opened up the vista of a reign of industrial terror; but every wrong has its remedy, and we believe Mr. Justice Farwell has found salvation for free labor in this country. The principle will apply to all kinds of labor, and it will be open to the employer to sue for damages for any loss sustained through the acts of trade union emissaries.

The strike was settled by the men being taken back without prejudice. We judge that the company won, or was in a position where it could win, but made several concessions, the chief of which was in agreeing to take back all the men (except law breakers) in a month; notwithstanding that the company had hired many new men whom it was bound to take care of. It is said that some of the strikers gave the time-notice which they had agreed to give, but the majority left without notice; and, according to *Herapath's*, their union could have been held for this in the sum of \$10,000; but the road withdrew the suits which had been begun to recover this money.

Mr. Hopwood, Secretary of the Board of Trade, who was the active government officer in bringing about a compromise, gives to Mr. Bell, the Secretary of the Amalgamated Society of Railway Servants, a good character for fairness and conservatism; but his constituents were too hot-headed for him. Mr. Hopwood says that as a result of this negotiation he is convinced "that railway companies would lose nothing by deciding to receive in conference an agent of their servants, whoever he might be as long as they were given reasonable evidence that such an agent really represented the majority of a class and was prepared to take the responsibility of binding that class by his actions."

A conference of presidents and traffic officers of the railroads west of Chicago was held in New York City on Tuesday of this week, the same being one of the series of quarterly conferences begun last year at the instance of the Interstate Commerce Commission. About 60 representatives were present, but we see in the list no mention of the name of any Government official. Mr. Jeffery, of the Denver & Rio Grande, who presided at the last conference, acted in the same capacity at this session. All of the transcontinental lines were represented, except the Canadian Pacific. The principal subjects considered were the proposition to form a new transcontinental passenger association, in accordance with the report of passenger officers who held a meeting at Glenwood Springs, Col., last month, and the territorial freight committees which were provided for at the last quarterly conference. It does not appear that decisive action was taken on either of these subjects, and the most definite (published) result of the meeting was the ordering of further conferences to be held by traffic officers in New York City this week and in Chicago next week. The meeting "unanimously directed that irregularities in rates shall be removed," etc. The next quarterly conference will be held in New York City, Dec. 5. At the close of the meeting Mr. Jeffery told the reporters that the marked improvement in rate conditions which has been apparent during the past year, still continued; and he held that these quarterly conferences were valuable in maintaining this improved condition. He said that the local committees formed at St. Louis, Kansas City, St. Paul and elsewhere were not a failure, as had been stated in the newspapers; the St. Paul committee is the only one which has not been organized, conditions there being complicated by the presence of the lake carriers, who are not regulated by law; but Mr. Jeffery expects that it will soon be completed. The other committees, he says, are doing effective work. Speaking of the rate situation generally, and the persistence of cutting in some places on some kinds of traffic, Mr. Jeffery said:

"Perhaps the rate situation is as good as it is possible to be. The millennium has not yet arrived. Before it comes there always will be a little trouble here and there." This is exactly the same view of the case that was taken by Professor Hadley many years ago; and the coincidence of expression is worthy of note from the fact that one of the speakers judges by long experience, while the other was reasoning largely from a philosophical consideration of the elements of the situation as judged from the standpoint of a disinterested student. Those who still believe that rate cutters can be reformed by direct repressive statutes cannot do better than reflect on utterances like these.

We spoke lately of the tendency to establish commercial and industrial schools in the colleges and universities. This week we note the establishment at the University of Michigan of a course in naval architecture and marine engineering, and also at the University of Wisconsin of a school of commerce. To the casual European it might seem strange to establish a school of naval architecture more than 600 miles from the nearest seacoast, but the American will realize that the University of Michigan is excellently situated to enable its students to see actual construction in important shipyards, although it is 600 miles from the Atlantic. We do not know how far the new enterprise at the University of Wisconsin is due to the zeal and untiring energy of the dean of the engineering faculty, but we take it that this whole movement, not only at Wisconsin but at the other schools, has been greatly stimulated by his labors.

The Fastest Trains of the World in 1899.

Under this title a correspondent writes to *The Times* (London), of Aug. 17, and we reprint the article below. We suppose, from internal evidence, that the author of this article is Mr. W. M. Acworth, although we have no information of that fact. The detailed performance given in table No. 4 has been printed in the *Railroad Gazette* once, and probably twice, but it is worth printing again. Table No. 1 is not entirely correct for the year 1900. We believe that the Reading, this year, has but one train scheduled at 66.6 miles an hour, one minute having been added to the time of two others, slightly reducing the

Table No. 1.

The Fastest Booked Speeds of the World in 1899 from Start to Stop.

Railroad.	From.	To.	Miles.	Speed, start to stop. Miles per hour.
Phil. & Read. R. R.	Camden	Atlantic City	55½	66.6
Pennsylvania R. R.	"	"	59	64.3
Midl.	Morceux	Bordeaux (Controle)	67½	61.6
Pennsylvania R. R.	Camden	Atlantic City	59	61.0
Phil. & Read. R. R.	"	"	55½	60.5
"	Atlantic City	Camden	55½	60.5
Nord.	Paris	Amiens	81½	60.5
L. & S. W. R.	Dorchester	Wareham	15	60.1
Pennsylvania R. R.	Camden	Atlantic City	59	60.0
Caledonian R.	Forfar	Perth	32½	59.1
Midl.	Morceux	Dax	24½	58.2
Orleans	Orleans	Bordeaux (Controle)	67½	58.1
"	Angoulême	Bordeaux	69½	58.1
"	Bordeaux	Angoulême	67½	57.6
Nord	Paris	St. Quentin	95½	57.4
Orleans	Angoulême	Poitiers	70½	57.0
Nord	Amiens	Calais Pier	104	57.2
N. Y. C. H. R. R.	Syracuse	Rochester	80	57.1
Pennsylvania R. R.	Atlantic City	Camden	59	57.0
"	"	"	59	57.0
"	"	"	59	57.0
Orleans	Poitiers	Angoulême	70½	57.0
Phil. & Read. R. R.	Mass. Ave.	Camden	56.8	56.8
Caledonian R.	Stirling	Perth	33	56.5
Phil. & Read. R. R.	Atlantic City	Camden	55½	56.4
Nord	Longuean	Paris	79	56.4
Midl.	Dax	Bayonne	31	56.3
"	Bayonne	Dax	31	56.3
Orleans	Angoulême	Poitiers	70½	56.2
Midl.	Morceux	Bordeaux	67½	56.2
"	Bordeaux	Morceux	67½	56.2
Nord	Arras	Longuean	41½	56.2
Orleans	Poitiers	Tours	79	56.0
Nord	Paris	Longuean	62½	55.8
N. Y. C. H. R. R.	Albany	Utica	96	55.8
Caledonian R.	Perth	Aberdeen	89½	55.6
Nord	Paris	Busigny	113	55.6
"	Arras	Arras	120	55.5
Phil. & Read. R. R.	Camden	Atlantic City	55½	55.5
"	"	"	55½	55.5
"	"	"	55½	55.5
"	"	"	55½	55.5
Orleans	Paris	Orleans	73½	55.3
Pennsylvania R. R.	Camden	Atlantic City	59	55.3
"	"	"	59	55.3
G. N. R.	Peterborough	Finsbury Park	73½	55.3
"	Hitchin	Huntingdon	26½	55.3
N. E. R.	York	Darlington	44½	55.3
Orleans	Tours	Poitiers	62½	55.1
"	Tours	Tours	69½	55.1
Nord	Amiens	Boulogne	77	55.0

N. B.—It was found necessary to limit this return to 55 miles per hour, as the number of French and United States, and even British, runs at 53 and 54 is very great.—Extracted from Official Time Tables. December, 1899.

average speed. The Pennsylvania is running to Atlantic City one train at 65.5 miles an hour.

Now that the summer holiday season has brought out our best trains and train services in Great Britain, it may be useful to set forth, for the edification of the student of such subjects and the general interest of the public, the fastest booked speeds of last year throughout the world, thus af-

Table No. 2.

French Expresses.—Complete Journeys, Including Stoppages. 1899.

Railroad.	From.	To.	Distance, miles.	No. of Stops.	Time Stoppages (Minutes).	Speed Inclusive of Stops, Miles Per Hour.
Midl	Bayonne	Bordeaux (Controle)	123	12	12	57.7
Nord	Paris	Calais Pier	185½	1	1	57.1
Midl	Bordeaux	Bayonne	123	12	12	55.8
Orleans	Bayonne	Bordeaux	123	12	12	54.7
Nord	Paris	Jeumont (Frontier)	363¾	4	17	54.2
Orleans	Bordeaux	Paris	363¾	4	17	53.8
Nord	Paris	Bordeaux (St. Jean)	363¾	4	17	52.4
Orleans	Lille	Paris	143½	1	4	51.9
Nord	Bordeaux (Bastide)	Paris	155¾	3	8	51.7
Orleans	Bordeaux	Paris	359	4	17	51.4
Nord	Boulogne	Paris	158	1	5	51.3
Joint Service—Orleans and Midl (included in above list)	Paris	Bayonne	486¾	8	24	54.1

East Coast Expresses.

Train.	From.	To.	Miles.	Journey Rate, Including Stops, Miles Per Hour.
"Sleepers"	King's-cross	Edinburgh	393½	50.7
"Flying Scotsman"	"	"	393½	46.2
"Diner"	"	"	393½	46.7

fording also a useful set of tables for comparative purposes. To any one who makes the attempt it will soon become evident that to collect and collate the information here given is a task of no small magnitude, and, in fact, no such thing has ever been done before. Table No. 1 shows that, of the nine fastest trains of the world, eight are run on the great competitive routes between Camden and Atlantic City, the Midl of France just managing to sandwich itself in the middle. This year the "Atlantic City flyers" give us several more lightning runs; as the Philadelphia & Reading, yielding to suggestions made by the compiler of these tables, has put on two "flyers" at 66.6 miles per hour in the opposite direction, and the moment these trains were announced the Pennsylvania hurriedly put on corresponding ones at 64.3 miles per hour, and also quickened another train from Camden to Atlantic City to the same speed.

The feature of this table is that only five English runs and

Table No. 3.

The Fastest Long Distance Trains of the World. Showing booked speeds, 1899. Including all stops and slacks.

Route.	Railways.	From.	To.	Miles.	Time—Hours, minutes.	Inclusive speed in miles per hour.
Sud Exp's	Orl ans & Midl.	Paris	Bayonne	486¾	8 59	6 54.13
Emp. State	N. Y. C. & H. R.	N. York	Buffalo	440	8 15	4 53.33*
Express	R. R.	London	Edinb'ro	393½	7 45	3 50.77
East Coast	Gt. N. and N. E. Railways	London	Glasgow	401½	8 00	3 50.18
West Coast	L. & N. W. and Caledon'n Rys	London	Glasgow	401½	8 00	3 50.18

*This train has no fewer than 28 booked slacks, many of them for miles through crowded streets, and in addition it is constantly checked at level crossings and drawbridges, and yet it is always on time at terminal.

December, 1899.

three Scottish ones come up to the 55 miles per hour standard. This is bad enough, but when the tale of 1900 comes to be told, it will be seen that our French and American friends have gone still further ahead, while we have gone back. Needless to say, rigid punctuality is maintained on these lines. Would that one could say this for Great Britain.

Table No. 2 compares the long French journeys with the running between the metropolitan cities of our two kingdoms by the shortest route.

Table No. 3 disposes of the boast still printed in the official publications of the N. Y. C. & H. R. R. that "the Empire State Express is the fastest regular train on earth," though she probably has the most difficulties to contend with in maintaining punctuality. The "Sud Express," however, has quickened again this year, and "the great four-track road of America" must look to its laurels.

Table No. 4 will enable the public to realize that 66.6 miles per hour, start to stop, can be not only easily maintained, but improved upon. The official figures for 1899 were not available, though from trustworthy reports the running was quite as fine as in 1898. It must be borne in mind that these "Atlantic City flyers" start on their swift career, and finish the same, through some miles of crowded streets, and that they are crossed at grade by the rival line, and the details

Table No. 4.

(From an Official Return to Theo. Voorhees, First Vice-President.)

"The Atlantic City Flyer." Philadelphia & Reading R. R. Speed (booked), 55½ miles in 50 minutes. Start to stop, 66.6 miles per hour. Locomotive No. 1028.

July, 1898.

Date.	Weight of Cars, Tons (British).	Minutes.	Miles per hour.
1	170	45¾	73.6
2	234	50¾	66.3
3	206	47	70.8
4	170	46½	72.4
5	170	49¾	67.3
6	170	47¾	70.4
7	170	45¾	72.8
8	234	47	70.0
9	170	46	72.4
10	170	48	69.4
11	170	45¾	72.8
12	170	47¾	69.7
13	170	47	70.9
14	170	47	70.9
15	234	52	64.0
16	234	47	70.9
17	170	48½	68.7
18	170	49¾	67.3
19	170	49	67.9
20	170	47	70.9
21	170	48	67.9
22	234	48½	68.7
23	170	47¾	69.7
24	170	47	70.9
25	170	47¾	70.5
26	170	47	70.9
27	170	47	70.9
28	170	48½	68.3
29	170	48½	68.0
30	234	48½	68.0

August, 1898.

Date.	Weight of Cars, Tons (British).	Minutes.	Miles per hour.
1	206	48½	69.0
2	206	48½	69.0
3	170	46¾	72.0
4	206	48½	69.0
5	206	44¾	74.4
6	234	47¾	70.5
7	206	47	70.8
8	206	46	72.4
9	206	47	70.8
10	206	46	72.4
11	206	46	72.4
12	206	46	72.4
13	234	47¾	70.5
14	206	45¾	72.8
15	206	47¾	70.5
16	206	47¾	70.5
17	206	45½	73.2
18	206	46¾	71.2
19	206	45¾	73.2
20	234	46¾	71.2
21	206	46¾	71.2
22	206	47¾	70.5
23	206	46¾	71.2
24	206	46¾	71.2
25	206	47	70.8
26	206	47¾	70.5
27	234	47¾	70.5
28	206	47	70.8
29	206	46	72.4
30	206	47	70.8
31	206	47	70.8

* "This signal was improperly thrown against the train either by accident or design."—Official Report.

of the daily running show that they are sometimes stopped, by signals; and yet, thanks to powerful locomotives with ample boilers, the lost time is always made up, though it sometimes entails running at 88 miles an hour for 17 to 20 miles on end.

Naval Architecture at the University of Michigan.

Prof. Herbert C. Sadler, B. S., late of Glasgow University, Scotland, has reported for duty at the University of Michigan and will begin work in the new course in Naval Architecture and Marine Engineering at the opening of college, Sept. 25. Prof. Sadler received his training in one of the principal shipyards of the Clyde and at Glasgow University. For the last four years he has been Assistant to Prof. Biles, and has been associated with him in his practice as a Consulting Naval Architect. He has had a large and varied experience in all branches of Naval Architecture on its practical side, and this, together with his experience as Assistant Professor at Glasgow University, renders him eminently suitable for the position he now holds.

The course of instruction in Naval Architecture, which is arranged as a graduate course, will commence at the second semester of the Senior year and extend to the end of the fifth year. At the end of the Senior year students may receive the degree of Bachelor of Science in Engineering and at the end of the fifth year that of Master of Science. Lectures will be given upon Ship Calculations, Strength of Ships, Resistance and Propulsion, Stability and Rolling, Ship Design, Practical Shipbuilding and Marine Engine and Boiler Design. In the drawing class each student will perform all the calculations connected with a vessel, and will also prepare one or more designs, including complete plans and specifications.

A circular description of the course of instruction may be had by addressing Prof. Sadler direct or the Dean of Engineering Department, Ann Arbor.

TECHNICAL.

Manufacturing and Business.

Wm. S. Brewster, dealer in railroad equipment and supplies, formerly of Chicago, Ill., has opened an office at 1640 Champa street, Denver, Colo.

In a recent communication to the Bullock Electric Mfg. Co., Messrs. Geo. A. Fuller Co., contractors for the Broadway Chambers Building, New York city, a model of which

is exhibited at the Paris Exposition, say: "Your dynamo forms a prominent feature of our exhibit, and helped to obtain the grand prize and gold medals which have been awarded to this exhibit."

During the last sixty days the Light Inspection Car Co., of Hagerstown, Ind., has made shipments of Hartley & Teeter light inspection cars to the following foreign countries: Canada, Mexico, Cuba, Peru, Venezuela, Brazil, Uruguay, Argentine Republic, Germany, Siberia, Australia, British India, and the Gold Coast of Africa. Domestic trade has also been good.

The Powers Regulator Co. received the highest award in its class for their system of automatic control of temperature. The Company are making good progress in the adoption by the railroads of their device for passenger cars, and several prominent roads in the East are applying this system to their trains. In tests made by one of the eastern roads last winter, considerable economy was shown in the use of steam; regardless of the varying pressure from the engine, the cars were held at a uniform temperature.

Among recent orders received by the Atlantic Works, Incorporated, of Philadelphia, Pa., were two three-spindle boring machines and one large double-acting tenoning and duplicating machine from the South Baltimore Car Works, of Baltimore, Md., and a large self-feed vertical cut-off saw machine from the Pennsylvania R. R. Company for the Mt. Vernon shops, of Baltimore, Md., also a complete pattern shop equipment, consisting of band saw machine, jointer, wood lathe, universal saw bench, and scroll saw machine for the Lukens Iron & Steel Co., of Coatesville, Pa.

The steel plant formerly owned by the Lima Locomotive & Machine Co., at Lima, Ohio, after being closed for a year and a half, was sold and reorganized under the name of the Lima Steel Casting Co., with an entirely new management. The following are the officers of the company: L. G. Neely, of the Auglaize Machine Company, St. Marys, Ohio, President; G. W. Van Dyke, Vice-President; D. E. Harlan, Secretary and Treasurer. The other Directors of the company are J. D. S. Neely, General Manager of the Ohio & Indiana Gas Co., and J. W. Van Dyke, General Manager of the Solar Refining Co. The plant has been thoroughly overhauled and repaired and much new machinery added, and it has been in successful operation since January 1, and is now on a firm financial footing, as the names of the officers indicate.

Iron and Steel.

The Pennsylvania Steel Co. has the contract for 6,500 tons of 86-lb. rail for the East Indian Ry. Co.

A dispatch from Constantinople says that the bid of the Carnegie Company to supply material for the railroad from Damascus to Mecca is lower than the other competing firms.

The Janson Steel & Iron Co. was incorporated in New Jersey last week, with a capital of \$100,000, to make railroad spikes. The incorporators are: Frank Janson, Valentine Janson, Joseph Janson, Frank Kasel and Joseph Becker. The principal office will be at Oxford, N. J.

Air-Brake Inspection of the Nashville, Chattanooga & St. Louis Railway.

The following is a summary of the May and June air-brake records of the Nashville, Chattanooga & St. Louis. The July record was published by us Sept. 7. During May, 729 air-brake cars were received at Nashville with the brakes cut out, and in June, 216. The names of the makers are given, together with the causes for which the brakes were cut out. In May, 2 per cent. and in June 1 per cent. of the Westinghouse braked cars entering Nashville had the brakes cut out strictly on account of triple valve defects; of cars entering fitted with New York brakes, 16 per cent. were cut out in May for triple valve defects and 27 per cent. were cut out in June.

Westinghouse.

	May.	June.
Blowing at exhaust port	184	89
Unions leaking	97	31
Release valves leaking	39	8
Brake rigging out of order	53	16
Branch pipe broken	14	4
Check valve case gasket blown out	56	29
Drain cup union leaking	1	..
Union nuts broken	1	..
Cylinder gaskets blown out	1	..
Sand hole in auxiliary reservoir	1	..
Bad wheels	2	..
Brake sticking	7	2
Train pipe broken	1	1
Train pipe leaking	3	..
Branch pipe leaking	3	..
Piston packing leather bad	1	..
Works emergency, service application	1	..
Piston travel too short	7	..
One-half in. cap screws broken	7	..
Check valve case broken	2	..
Nothing wrong	1	..
Piston head broken	..	2
Working parts of triple valve gone	..	1
Triple valve broken	..	1
Cylinder release spring broken	..	1
Sand hole in triple valve	..	1
	482	186

New York.

Blowing at exhaust ports	31	8
Blowing at vent ports	83	11
Works emergency, service application	2	..
Unions leaking	38	3
Triple valve body broken	1	..
Working parts triple gone	1	..
Piston head broken	1	..
Brake rigging out of order	17	1
Branch pipe broken	1	1
Train pipe broken	1	1
Release valves leaking	51	..
Piston travel too short	10	..
Front cap gasket blown out	..	1
	237	25

Landsberger.		
Blowing at exhaust ports.....	6	1
Train pipe broken.....	1	1
Boyden.		
Blowing at exhaust port.....	1	3
Union leaking.....	1	1
Brake sticking.....	1	1
Crane.		
Blowing at exhaust port.....	1	..
Total.....	729	216
The following relates to air-brake cars forwarded from Nashville:		
	May.	June.
Number of air-brake cars forwarded.....	8,678	8,502
Number forwarded with brakes O. K.....	8,588	8,442
Number forwarded with brakes cut out.....
Owned by railroads.....	51	19
Owned by private lines.....	39	41
Average serviceable air-brake cars per train.....	16.3	15.1
Number of air-brake cars forwarded with—		
Westinghouse brakes.....	7,925	7,771
New York brakes.....	727	705
Landsberger brakes.....	18	15
Boyden brakes.....	8	10
Crane brakes.....	..	1
Defects—		
Blowing at exhaust—		
Westinghouse.....	14	9
New York.....	..	6
Landsberger.....	12	13
Boyden.....	..	2
Blowing at vent ports, New York.....	5	..
Check valve case gaskets blown out, Westinghouse.....	6	..
Triple valve gaskets blown out, Westinghouse.....	1	..
Works emergency, service application, New York.....	7	..
Release valve leaking.....	18	8
Auxiliary reservoir leaking.....	1	..
Piston packing worn out.....	2	..
Piston broken.....	1	1
Angle cock broken.....	1	..
Cut out cock broken.....	1	..
Train pipe broken.....	3	3
Branch pipe broken.....	1	3
Brake rigging out of order.....	17	9
Sand hole in triple valve body.....	..	2
Cylinder release spring broken.....	..	2
Piston packing ring broken.....	..	2
Total.....	90	60

Some New Alloys by the Ajax Co.

The recent discovery of Goldschmidt, that aluminum in powder form is one of the most powerful reducing agents known, has attracted widespread attention. It is possible by this means to reduce the most refractory oxides, and produce such metals as chromium, tungsten, molybdenum, manganese and nickel, perfectly free from carbon and in the fused state. This is possible because of the enormous heat produced by the chemical reaction of the aluminum upon the various oxides. The heat so produced is estimated at about 5,000 deg. and can be equaled only in an electric furnace. The Ajax Metal Co., of Philadelphia, have acquired a similar process for producing the alloys of the above metal with iron, and so low in carbon and silicon as to meet all the requirements of steel makers, but by the use of a less expensive agent. Ordinary carbon steel castings can be made by this process in the crucible or on the open hearth. The castings so produced are so low in carbon, as to almost approach malleable iron, and require no annealing. The Ajax Metal Co. intend to manufacture these alloys in ingot form for the use of tool steel makers, and manufacturers of armor plates, projectiles, etc., also to manufacture chrome, nickel and ordinary steel castings of superior quality.

The Hamlin Car Wheel Company.

The Hamlin Car Wheel Co., of Catawissa, Pa., has been incorporated in Delaware, with a capital stock of \$100,000. We noted in our issue of Aug. 10, p. 542, that the Hamlin Car Wheel Works were sold to J. K. Lockard, who would organize a new company.

Automatic Blocks With Two Distant Signals.

The electro-pneumatic automatic block signals which have been in course of construction for some time on the Pennsylvania Railroad between Altoona and Gallitzin, 12 miles, are nearly finished and will be put in operation within a week or two. This part of the line, which is the steepest portion of that on the eastern slope of the Alleghenies, is now four-tracked for the whole of its length. The block sections are each about 4,000 ft. long; and on the east-bound tracks, descending at about 95 ft. to the mile, each section has two distant signals, one on the home signal post one block in the rear; and the other on the home signal post two blocks in the rear. Each post has three arms—a home for the block in advance, a distant, for the second block in advance, and, below this, another distant for the third block in advance. Mr. A. M. Keppell, Jr., President of the Railway Signaling Club, has charge of the automatic signals on this division of the Pennsylvania.

The Bonzano Rail Joint.

We are informed that Mr. A. Bonzano received from the National Export Exposition of 1899 (Philadelphia) a silver medal and diploma for the well-known Bonzano Rail Joint. The award is made for "a joint possessing strength, rigidity and durability in a very marked degree." The Committee of Awards consisted of Messrs. A. E. Outerbridge, Jr., Wm. R. Webster, Thos. P. Conard, Wm. C. Henderson and Jacob Y. McConnell. We are informed that this was the only rail joint which received a medal and diploma at the Exposition.

A Large Steel Rolling Door.

The Kinnear Mfg. Co., Columbus, Ohio, has just completed a steel rolling door for a car house at Worcester, Mass., which is 35 ft. 6 in. wide and 20 ft. high. This is said to be the largest door of the kind so far built and works with the same ease as the smaller doors, shutters and partitions which are now commonly used at freight stations and warehouses. The advantages claimed

for these doors are the ease of operation and compactness, the fire-proof qualities and the low cost for repairs.

Medals for the Shaw Electric Crane Co.

Word has just been received by Messrs. Manning, Maxwell & Moore, sole sales agents of the Shaw Electric Crane Company, that the International Jury has awarded to the Shaw Electric Crane Co. a gold medal in Class 21, General Mechanical Apparatus, and a silver medal in Class 23, Electrical Appliances for Hoisting.

High-Speed Brakes on the Southern Pacific.

The Westinghouse Air-Brake Company has, within the last two or three months, furnished several sets of high-speed brake equipment for the Southern Pacific Railway.

Car Lighting.

The Standard Car Lighting Company has been incorporated under the laws of New Jersey with an authorized capital of \$1,500,000.

The Keystone Car Wheel Co.

In our issue of June 8, p. 376, we noted the formation of the Keystone Car Wheel Co., of Pittsburgh, with office at 1201 Park Bldg. The company, on Sept. 17, began operations at its new plant on the Pittsburgh, Virginia & Charleston R. R., which will have a capacity of 330 wheels a day. The officers are: C. V. Slocum, President; W. W. Lobdell, Vice-President; L. B. Whitney, Treasurer; J. H. Yardley, Secretary.

THE SCRAP HEAP.

Notes.

The ferryboat "Plainfield," of the Central of New Jersey, was destroyed by fire, while undergoing repairs, at Jersey City, Sept. 8.

The Pennsylvania road has taken in the Buffalo & Allegheny division into its pension system, and about 100 employees of this division are to be retired.

The Canadian Pacific, after negotiations with representatives of all the trainmen on the Ontario and Quebec divisions, has advanced the pay of some of the freight conductors and yard trainmen. The application of passenger trainmen for increased pay was not granted.

Passenger train No. 3 of the Burlington road was robbed by a masked man, near Haigler, Neb., at 1 o'clock on the morning of Sept. 12, and passengers lost about a thousand dollars. The robber, who was alone, compelled seven passengers to give up their valuables and then he pulled the bell rope, jumped off and got away.

An officer of the Michigan Central denies the accuracy of the report that his company has re-entered the freight clearing house at Buffalo. The company is still opposed to the clearing house on principle, believing junction settlements to be the most economical; but it has consented to join the other roads in using the clearing house for transcontinental freight alone.

It is said that the officers of the Pullman Company are seriously considering the question of putting iron safes in sleeping cars, to hold passengers' valuables. At the same time, the newspapers print reports to the effect that lawyers in a number of Western cities are preparing numerous damage suits against the Pullman Co. for large sums lost by passengers in train robberies.

St. Louis papers state that Mr. E. B. Pope, of that city, Western Passenger Agent of the Chesapeake & Ohio, has devised an arrangement for having a "hind light" on railroad trains. Mr. Pope would mount an electric search light on the roof of the cab of the locomotive, with the reflector facing to the rear. By putting the lamp on a suitable revolving table, the engineman could sweep the horizon with the rays of the light at any time.

In Montgomery, Ala., recently, a city ordinance has been put in force, requiring colored passengers to ride in the rear part of street cars, the front portion to be reserved for white passengers. It appears from the newspapers that the negroes resent the separation, and now refuse to ride on the cars. This leaves the cars wholly to the whites, and it is said that many persons who formerly did not patronize them are now using them. To such an extent is this true that on one line the receipts are larger than when both whites and blacks patronized the cars.

Railroad Commissioner Osborn, of Michigan, has issued an order requiring all freight cars in that state to be equipped with automatic couplings before July 1, 1901. The Commissioner acts under a statute passed in 1887 requiring all cars operated on Michigan roads to be equipped prior to 1891, but the law was a dead letter on account of the large percentage of interstate business on all the roads. The going into effect this year of the Federal law providing for the use of automatic couplings on all cars used in interstate traffic has enabled the Michigan commissioner to enforce the old statute.

Traffic Notes.

It is reported that the roads carrying grain from Lake Erie to New York city have agreed that the New York Central shall take 55 per cent. of the whole, the Erie 25 per cent., the Lehigh Valley 16 and the Lackawanna 4 per cent. Mr. Frank Harriot, late of the Erie road, has been appointed Joint Agent of the lines to manage this grain business. He will have regular reports from all the companies and will have power to change the rate when necessary.

The Journal of Commerce, New York city, says that New York grain dealers have decided that it is not worth while to worry about the competition of the port of Montreal in the export grain business. Shipments through that city this year have not been heavy and difficulties are frequently encountered in getting vessels to go to Montreal for grain. The Traffic Manager of the Canada Atlantic

says that his road is going to ship grain to Quebec, on account of the lack of facilities at Montreal.

About two months ago the Commissioner of Internal Revenue decided that truckmen or others gathering small packages of freight and packing them in large trunks or boxes for railroad shipment were liable as carriers under the war revenue act; and must issue a stamped receipt for every parcel accepted. It is now announced that this ruling has been reversed. Shippers in New York appear to be considerably exercised over a rule of the Trunk Line freight classification, under which they say that the railroads are trying to compel shippers to abandon the grouping of small packages of different kinds of goods, often for different consignees, in a single large box.

Krupp Iron Works.

A report to the State Department from the Consul General at Frankfurt, describes the works of Frederick Krupp. These comprise the following: Cast-steel works at Essen; Krupp steel works, formerly F. Ashtöwer & Co., at Annen, in Westphalia; the Gruson Works, at Buckau, near Magdeburg; four blast furnaces at Duisburg, Neuwied, Engers, and Rheinhausen (this latter consists of three furnaces with a capacity for each of 230 tons per 24 hours); a foundry at Sayn; four coal mines (Hanover, Saelzer, Neunack, and Hannibal), with interest in other coal mines; more than 500 iron mines near Bilbao, in Northern Spain; artillery firing-grounds at Meppen, with a length of 10½ miles and a possibility of extension for 15 miles; three ocean steamers, several stone quarries, clay and sand-pits, etc. In addition, the firm of Frederick Krupp operates the Ship & Machine Stock Co. Germania at Berlin and Kiel, under contract. The articles made at Essen include cannons (up to the end of 1899, 38,478 had been sold), projectiles, etc.; gun-barrels, armor-plate, railroad material, material for shipbuilders, parts of machinery, steel for tools and other purposes. The steel works in 1899 operated about 1,700 furnaces, forge fires, etc., about 4,000 machines, 132 steam hammers, more than 30 hydraulic presses (among them 2 of 5,000 tons each, 1 of 2,000 tons, and 1 of 1,200 tons' pressure), 316 stationary steam-boilers, 497 steam engines with an aggregate of 41,213 h.p., 558 cranes of from 400 to 150,000 tons' lifting power. During the last year, the iron mines yielded an aggregate of 1877 tons of ore per day. The coal production from the mines belonging to the Krupp Company (excepting the Hannibal) amounted, on an average, to about 3,738 tons for each working day. The electrical plant at Essen has three power-houses with six distributing stations, and supplies 877 arc lights, 6,724 incandescent lamps, and 179 electric motors.

For the traffic of the works, railroad tracks of standard gage of about 36 miles are laid. Sixteen locomotives and 707 cars are operated on the grounds. In addition, there are narrow-gage tracks of 28 miles, with 26 locomotives and 1,209 cars. The telegraph system of the steel works has 31 stations, with 58 Morse telegraphic instruments and 50 miles' circuit. The telephone system has 328 stations, with 335 telephones and a circuit of 200 miles. On April 1, 1900, the total number of persons employed in the different works was 46,679, viz., 27,462 at Essen, 3,475 at the Gruson works of Buckau, 3,450 at the Germania works at Berlin and Kiel, 6,164 in the coal mines, and 6,128 at the blast furnaces and on the proving grounds at Meppen, etc.

The Siberian Railroad in War Time.

The Siberian Railway beyond Chelyabinsk is now entirely taken up with the conveyance of troops and stores for the Russo-Chinese frontier. No goods whatever are accepted from private consignors, and several of the passenger trains are closed to the public, who can only with great difficulty find a place even on such trains as are nominally still open to all. There appears to be considerable difficulty in working the railway, and men have been drafted from all the lines of European Russia at double wages and a daily bonus to work on the Siberian line. The want of engines is, however, the principal obstacle to be contended with. Even the magnificent through Siberian weekly express to Irkutsk is taken on from Chelyabinsk by old (borrowed) locomotives. Under such circumstances breakdowns are frequent. Several accidents involving loss of life have already occurred, but no details are allowed to reach the public. In Irkutsk, as, indeed, all along the line, the prices of all kinds of food supplies have risen to famine rates in the last week or so. Telegrams to private persons, although treble rates have been paid on them as "Urgent," do not come to hand. The Nijni Fair has suffered in respect of Siberian products in consequence of the blockade, and not more than half the usual quantity of Siberian goods has been brought down for sale.—London Standard.

Welding by the Goldschmidt Process.

At the congress of the Saxon associations of engineers and architects recently held at Leipzig, Mr. Max Schiemann, of Dresden, delivered a lecture, accompanied by experiments, on the "Goldschmidt Process for Obtaining High Temperatures and Its Practical Application." He compared this new process with those hitherto used for heating metals for welding. He showed by experiments the new method of welding cast-iron gas pipes of 2 to 4 in. in diameter, and demonstrated the very simple application of the process and its result. Briefly stated, it consists in mixing powdered aluminum with oxide of iron and adding to it an easily ignitable substance. This powder is put into a clay crucible, and then ignited by means of a match. The resulting chemical action renders the mixture liquid, and this liquid is then poured around the place to be welded. The object assumes a white heat, and the welding is done by a very simple apparatus. In the near future, it is proposed to weld the rails of the electric tramway at Dresden, which has already been done in other cities. The speaker welded rails before the audience, and the experiments were pronounced very successful, especially on account of the simplicity of the process.

South American Notes.

The La Plata Post reports that the German Consul in Cochabamba, Mr. Rudolph Kriger, has applied to the Bolivian Government for a concession for a Berlin syndicate for a railroad to begin at a port on the Paraguay River and thence to Santa Cruz de la Sierra, with branch lines to Sucre, Cochabamba, Oruro, La Paz and Potosi. The company asks 10 kilometers of land on either side of the line, and privileges for 60 years, after which the State may buy the property.

Increased Rate of Combustion.

Independently of the greater economy and higher rates of combustion, mechanical draft stands as the only means by which the increased rate can be economically obtained. Coincidentally the boiler capacity must of necessity be greater, provided the grate area is maintained. The expense or inconvenience of a chimney, to obtain rates above 20 or 25 lbs. per square foot per hour, becomes so great as to practically preclude an increase. As observed by A. J. Durston, "as long as draft was dependent upon a funnel for its production, a much

greater combustion than 25 lbs. of coal per square foot of grate was rarely achieved; with artificial draft, on the other hand, the rate of combustion may be accelerated to any amount, and as a boiler's capability of transmitting heat without injury to itself is simply a matter of degree, experience has been necessary to determine the rates of combustion that can with safety be employed with different types of boilers." When it is considered that in boilers of the marine type the combustion rate resulting from the employment of mechanical draft is now carried as high as 40 to 50 lbs., that in torpedo-boat and similar service a rate of 70 to 80 lbs. is frequent, and in locomotive practice as high as 120 lbs. is not at all unusual, the possibilities of increased rates of combustion with mechanical draft are evident.—*Mechanical Draft*, by B. F. Sturtevant Co.

Twenty-four O'Clock Notation in Spain.

The Government of Spain has issued notice that in the railroad, mail, telegraph, telephone and steamship service of that country, and in all ministerial offices, the courts and public works, the computation of the hours, after the first of next January, is to be made by the numbers 1 to 24, beginning at midnight. Midnight will be designated as 24, but for the next 59 minutes a cipher will be used; for instance 12:30 will be called 0:30. Greenwich time is to be the standard.

Lackawanna Freight Station in Brooklyn.

The Delaware, Lackawanna & Western has just opened its new freight station at Clymer street, Brooklyn, N. Y. At this station there is a brick warehouse with large electric elevators, and team tracks accommodating 90 cars. Derricks are provided at convenient points for loading and unloading heavy articles.

Railroad Material for Japan.

The Imperial Government Railroads Department of Japan gave orders during last year to England and the United States for the following railroad material, which is to be imported during the fiscal year ending March 31, 1901: Locomotives and cars, \$1,700,000; rails, 26,000 tons, \$2,300,000; 100 ft. bridge girders, 49 spans, \$740,000; 200 ft. bridge girders, 11 spans, \$250,000; other bridge girders, 7,000 tons, \$250,000. Total, \$5,240,000. Most of the bridge girders and rails are being made in this country, while Neilson & Dubs & Co., of England, are named as the makers of all the locomotives.

The Wachusett Dam, Massachusetts.

Proposals will be received at the office of the Metropolitan Water Board, Boston, Mass., until Sept. 25, for building the Wachusett Dam, in the Nashua River at Clinton, Mass. The dam is to be built of rubble masonry, faced with coursed ashlar and dimension stone masonry. The distance across the valley at the level of the crest is about 1,250 ft., and the total length of the dam, including the waste-weir, will be about 1,400 ft. In the deepest part of the valley the top of the dam will be 145 ft. above the bed of the river and about 200 ft. above the rock. Where the dam is highest it will have a thickness of about 175 ft. at the base, and at the top the thickness will be about 23 ft. The depth of earth excavation in the bottom of the valley will be about 60 ft. Temporary dams and a flume for protecting the excavations have already been built. The Board owns an undeveloped quarry near the dam, from which the contractor may take granite. The dam and its appurtenances will require about 267,000 cu. yds. of earth excavation, 100,000 cu. yds. of rock excavation and 288,000 cu. yds. of masonry. The work must be finished before Nov. 15, 1904. Henry H. Sprague, Chairman Metropolitan Water Board; Frederic P. Stearns, Chief Engineer.

The Firemen's Brotherhood.

Grand Master Sargent of the Brotherhood of Locomotive Firemen, in an address at the recent Des Moines convention of the order, gave the present membership as 36,789, an increase of 9,551 since 1898, the date of the last biennial convention. The number of lodges in good standing is now 564, an increase of 26, and the death and casualty claims paid in the two years were \$883,572, an increase of \$220,846, as compared with the amount spent in the preceding biennial period.

The All-Powerful Labor Vote.

Trainmen in Texas are not discouraged by the defeat of their attempt to get the State Railroad Commission to prohibit double-heading. A legislative lobby has been organized and the question has been made a political issue of the present campaign by the insertion of a clause in the Democratic platform pronouncing against double-heading.—*Exchange*.

Assurances Concerning the Two-Penny Tube.

The following letter from Sir Benjamin Baker, Chief Engineer of the Central London Railway, appeared lately in the *Times* (London): "In reply to the inquiry as to what would happen in the event of a train filled with passengers being stopped for half an hour in the middle of a tunnel on the Central London Railway, or other of similar construction, permit me to say that the purity of the air breathed by the passengers would be practically unaffected, but that the temperature might appear somewhat high in contrast to the cold tunnel unless the end doors and side ventilators were all kept open. Numerous experiments have proved that the oppressive condition of air sometimes complained of in railway carriages above or below ground is related to the temperature and not to the purity of the air; so that, whilst in summer people may complain of being suffocated, though all the carriage windows are open, in winter they feel no such oppression though they remain all night in a well-filled carriage with every window and ventilator studiously closed. It has been practically demonstrated that a live man might be sealed up in a lead coffin for half an hour without any resultant feeling of oppression—I say nothing of depression—provided he were treated as frozen mutton in a cold store, so that the air he breathed, though astoundingly foul from repeated breathing, might still remain cold. The worst that could happen from a stoppage of many hours in a small tunnel would be that some of the passengers might get as warm as if they were in the cheap seats of a theater, assuming they remained in the carriages, which is not at all likely, as convenient gangways are provided along which passengers could walk to the nearest station, and supplementary lights are available in the event of a breakdown of the ordinary system."

A New Train Bulletin.

The Standard Bulletin Company, of 1004 Norwood avenue, Toledo, Ohio, of which Mr. E. S. Brooks is Manager, has lately put up a number of station bulletins, of novel design, to give information concerning trains that are due to arrive. These bulletins are at Sandusky, on the Lake Shore & Michigan Southern; at Massillon, on the Wheeling & Lake Erie, and at Columbus, on the Toledo & Ohio Central. The essential part of the device is a roller 22 in. long and 5 in. in diameter, made of wood; or, rather, a group of disks 5 in. in diam., carried on an axis 22 in. long, each roller containing letters or figures

on its periphery, like a cyclometer, so arranged that by revolving the various rollers different combinations of words can be shown. For example, one of the rollers used on the Lake Shore road is illustrated in the company's circular, showing the date, number of train, direction, time due, and degree of lateness of a train, as below. The roller is placed horizontally in a metal case, which is

SEP. 18, 36 EAST; 9:10 A.M., 1 HR. LATE.

galvanized iron if the bulletin is outdoors, and oxidized copper if indoors. Any person intelligent enough to read and write can, in 20 seconds, set the bulletin to show any train, on any date, going in any direction, due at any hour. The rollers at the right hand end have a sufficient assortment of figures and letters to bulletin any train not over 10 hours late. The same apparatus can be used for an east and west or a north and south road. Where trains are not frequent a single bulletin will answer for a station, but cases are made to hold any desired number of rollers.

New Iron Furnaces.

According to the *Bulletin* there are now building in various parts of the United States, 23 new furnaces. Of these two are at South Chicago, by the Illinois Steel Co.; one at Thomas, Ala., by the Pioneer Mining & Manufacturing Co., and one at La Follette, Tenn., by the La Follette Coal, Iron & Ry. Co. The Carnegie Steel Co. is building two large furnaces at Rankin Station, Pa.; the Buffalo Charcoal Iron Co. has about finished a charcoal furnace at Buffalo, N. Y.; Joseph Wharton is building a furnace at Port Oram, N. J.; the Warwick Iron & Steel Co. is building one at Pottstown, Pa.; the American Steel & Wire Co. is building one on Neville Island, near Pittsburgh, Pa., and an additional stack at its Central Furnaces, at Cleveland, Ohio; Jones & Laughlins, Ltd., are adding a furnace to their Eliza plant, at Pittsburgh; the National Steel Co. is erecting three furnaces, one at New Castle, Pa., one at Mingo Junction, Ohio, and one at Youngstown, Ohio, and is also building another stack at Mingo Junction to replace one of its old furnaces now in use; the Sharon Steel Co. is building a furnace at Sharon, Pa.; the Roane Iron Co. is building a furnace at Rockwood, Tenn.; the Columbus Iron & Steel Co. has about finished two furnaces at Columbus, Ohio; the Globe Iron Co. is erecting a furnace at Jackson, Ohio; the Iroquois Iron Co. is erecting a furnace at Chicago, Ill.; and the Colorado Fuel & Iron Co. is erecting a furnace at Pueblo, Colo.

Underground Railroads in London.

Cable dispatches say that Mr. C. T. Yerkes has made arrangements under which he will be largely interested in building the underground electric railroad from Charing Cross, London, to Hampstead. In fact, it is said that Mr. Yerkes has bought the franchise and rights of the Charing Cross, Euston & Hampstead Railroad.

Safety Appliances.

The Automatic Safety Appliance Co., of Reading, Pa., has been incorporated in Delaware, the announced object being to secure patents granted to Gideon S. Jeffries covering safety appliances for railroads. The authorized capital of the company is \$1,000,000.

Technical Schools.

Purdue University entered upon a new school year on Wednesday, the 12th inst., with a larger number of students in attendance than ever before. The number of Freshmen will reach 350, and the total enrollment for the year will exceed 1,000. The increase in the attendance is very largely in the schools of engineering. Laboratory equipment has been increased, and one-half of a large building has been remodeled to supply a dozen additional recitation rooms.

Coal for the Austrian State Railroads.

The administration of the Austrian State Railroads has just published details on the above subject. The total quantity of coal required for 1901 is estimated at 2,324,000 tons. Of this quantity, namely 1,250,000 tons, has already been secured by existing contracts. For the remaining 1,074,000 tons public bids were asked for some time ago. Altogether thirty bids were received from Austrian and Upper Siberian mining companies, and a quantity of 1,036,000 tons has been secured. A further quantity of 36,000 tons is yet to be secured. The report says that the increase in the prices, as compared with the previous year's contracts, is great, and that on an average this increase amounted for bituminous coal to 37 per cent., and that even at these high prices the quality of the coal is lower than that of the previous year. Another drawback is that the contracting mining companies made so many reserves and extra stipulations that it is a great question whether the State Railroads can rely upon the delivery agreed upon. The total expenditure for the above quantities for 1901 will amount to 20 million florins, against 4,000,000 florins the year before.

Pig Iron Production in Canada in the First Half of 1900.

The production of pig iron in Canada in the first half of 1900, according to reports received by the American Iron & Steel Association from every maker of pig iron in the Dominion, amounted to 45,234 gross tons. The total production in the whole of 1899 amounted to 94,077 tons, against 68,755 tons in the whole of 1898. Of the production in the first half of 1900 about one-sixth was charcoal, the remainder being coke. In the first half of 1900 Canada produced both Bessemer and basic pig iron, two companies making Bessemer pig iron and one company making basic pig iron. The production of Bessemer pig iron was about one-third of the production of basic pig iron. Neither spiegeleisen nor ferromanganese was produced in Canada during the first half of 1900. The unsold stocks of pig iron in Canada on June 30, 1900, in the hands of manufacturers or their agents, and all of which was for sale, amounted to 13,672 gross tons, against 9,932 tons on Dec. 31, 1899. The number of completed blast furnaces in Canada on June 30, 1900, was nine, of which four were in blast and five were out of blast. On Dec. 31, 1899, there were also four furnaces in blast and five out of blast.

An Automobile Mile in 1:06.

Press dispatches say a mile was run by an automobile racing wagon, in one minute and six seconds, on Washington Park race track, Chicago, at the race and exhibition meet, Sept. 18. It is said also that the "driver" has hopes of taking the six seconds off this record, at the next trial. There is no moral or technical reason why this should not be done if the rider likes it; but what will it lead to? Must we expect learned wranglers of the Automobile Signal Club on "distant," "home," "permissive" and "absolute block" signals, with endless dissertations on color values?

The Galveston Disaster.

All of the railroads leading to Galveston appear to have decided to restore their lines to that city as soon as possible, although they have suffered enormous losses. The

different companies combined their forces to restore connection with Galveston Island by building a single temporary bridge, and it was expected that this bridge would be ready for use by the end of this week. The Union passenger station, owned by the Atchison, Topeka & Santa Fe, was not very badly damaged. The Galveston Wharf Company expected to have its wharf and elevators ready for use by the time the bridge was finished. From pier 10 to pier 36, this company had a lineal wharf frontage of four and one-third miles. It was nearly all carried out to sea. The wharf sheds of this company were capable of holding at one time 1,000,000 bales of cotton. It owned thirty-three miles of track, almost all of which was destroyed. Many miles of railroad were washed away on the mainland, all of the companies suffering seriously. On the Gulf & Interstate Railway, from Bolivar east to Highland, 21 miles, everything was washed away and 75 persons were drowned. The wharves, approaches and port of Bolivar, as well as railroad shops and rolling stock, were either completely destroyed or greatly damaged. On the St. Louis, Colorado & Santa Fe northbound passenger train was blown from the track three miles north of Alvin and wrecked, and three persons were injured. It is said that on this road every station, freight depot and water tank between Virginia Point and Roseberg Junction, 56 miles north, was either blown away or wrecked, and miles of track were washed away. Every town had a death list of from five to 15 persons, with many more injured. What is true of the Gulf, Colorado & Santa Fe is equally true of the Galveston, Houston & Henderson, used by the I. & G. N. and the Missouri, Kansas & Texas; also of the Galveston, Houston & Northern.

Strike in the Anthracite Coal Region.

A strike of miners, which was begun last Monday, has caused a stoppage of work in a large number of mines in the anthracite region. Press dispatches from Wilkesbarre and Scranton report from 40 per cent. to 80 per cent. of the miners as being on strike. The extent of the disturbance cannot at this writing be clearly defined, but the Lehigh Valley, the Central of New Jersey, the New York, Ontario & Western, and the Delaware & Hudson have already laid off large numbers of their freight trainmen in consequence of the diminution of coal shipments. A press dispatch of Wednesday stated that on the lines of the Reading Company only three mines had shut down.

LOCOMOTIVE BUILDING.

The Oregon Short Line is reported to be in the market for locomotives.

The Davenport, Rock Island & Northwestern will shortly be in the market for a few locomotives.

It is reported that the Kansas City Southern has ordered 10 compound locomotives from the Baldwin Locomotive Works.

The St. Louis Southwestern has asked for bids on locomotives, although it has not been definitely decided that the road will buy engines.

The Toledo, St. Louis & Kansas City has been reported as intending to place an order for a number of locomotives. It is learned that the company has prepared some specifications, but pending their completion several builders have offered figures with their own specifications.

The Chicago Great Western has placed an order with the Baldwin Locomotive Works for 10 compound consolidation locomotives. They will have 17 x 28 x 30 in. cylinders; 55 in. in diam. drivers; the estimated total weight being 180,000 lbs., with 160,000 lbs. on drivers. The tank capacity for water will be 6,000 gals.

CAR BUILDING.

Pittsburg & Lake Erie is in the market for 10 passenger cars.

The Maine Central is having 200 freight cars built by the Laconia Car Co.

The Kansas City, Omaha & Eastern will soon be in the market for coal cars.

The Jamaica Railroad has ordered two cars from the Jackson & Sharp Co.

The Lawrence Cement Co. is reported in the market for 50 60,000-lb. box cars.

The Union Pacific, it is reported, has, for a time, deferred ordering box cars.

The Chicago & Northwestern denies the report that it is in the market for new cars.

Algoma Central is asking prices on 50 additional box cars of 80,000 lbs. capacity.

The Western Central denies the report that it is in the market for new freight cars.

The Florida East Coast is having 25 cars built by the Southern Car & Foundry Co.

The Lake Shore & Michigan Southern is reported to be figuring on some new steel cars.

The Baltimore & Ohio is having two passenger cars built by the Jackson & Sharp Co.

The National Car Co. is having 100 freight cars built by the American Car & Foundry Co.

The Seaboard Air Line is having 41 freight cars built by the American Car & Foundry Co.

The Russell Snow Plow Co. has ordered two snow plows from the Illinois Car & Equipment Co.

The Parral & Durango is having two passenger cars built by the Barney & Smith Car Co.

Lake Shore & Michigan Southern, it is reported, has ordered four postal cars from Barney & Smith.

The Savannah, Florida & Western is having 50 freight cars built by the Southern Car & Foundry Co.

The Terre Haute & Indianapolis is having built by the American Car & Foundry Co. 100 freight cars.

The Chicago, Milwaukee & St. Paul is having one passenger car built by the Barney & Smith Car Co.

Kansas City, Ft. Scott & Memphis has ordered three chair cars and three coaches from the Pullman Co.

The Montana Coal & Coke Co. is having one freight car built at the works of the South Baltimore Car Works.

The Western Equipment & Construction Co. is having 25 freight cars built by the Illinois Car & Equipment Co.

The New Orleans, Port Jackson & Grand Isle is having 10 freight cars built by the Southern Car & Foundry Co.

The Davenport, Rock Island & Northwestern is asking prices on 50 80,000-lb. coal and 25 60,000-lb. flat cars.

The Toledo, St. Louis & Western has ordered six cars for passenger service from the American Car & Foundry Co.

The National Rolling Stock Co. is having three freight cars built at the Detroit Works of the American Car & Foundry Co.

The New York Central & Hudson River has ordered 500 box cars of 60,000 lbs. capacity from the American Car & Foundry Co. The road is reported to be in the market for 500 coal cars also.

The Toledo, St. Louis & Kansas City has been reported as intending to place an order for from 200 to 300 box cars. It is learned that the company has specifications in preparation, but, pending their completion, several builders have offered figures with their own specifications.

The Missouri Pacific, as noted in our issue of Sept. 7, has ordered 500 flat cars from the American Car & Foundry Co., for delivery in 60 days. The equipment includes American Steel Foundry Co.'s and Shickel, Harrison & Howard Iron Co.'s bolsters, half of each; National hollow brake-beams; Westinghouse air-brakes, Universal bearings, Trojan couplers, American Continuous draft rigging, McCord journal boxes and lids, Patterson-Sergeant paint and Pickering springs.

The Great Southern of Spain has placed an order with the Pressed Steel Car Co. for hopper cars at a total cost of about \$60,000, f.o.b. American ports. The wheels and axles will be furnished in Spain. The cars will not differ materially from the American pattern. They will be provided with wooden superstructures attached to the ends in the form of a shelter, to be used, it is supposed, by the brakemen for protection from inclement weather, etc. The cars will be used for hauling ore of less density than Lake Superior ore, therefore the cubic capacity will have to be larger in order to have the same weight carrying capacity as American cars.

BRIDGE BUILDING.

ADRIAN, MICH.—The City Council is reported to have decided to rebuild the bridge at Maumee street.

ALLENTOWN, PA.—The Allentown & South Allentown Bridge Co. has been chartered to build a bridge from the foot of Union and Eighth streets to Salisbury, the bridge to be about 1,900 ft. long and 46 ft. wide. The following are reported as incorporators: E. T. Clymer, M. C. L. Kline, Col. H. C. Trexler and C. D. Grim. R. S. Rathbun is the Engineer.

BALTIMORE, MD.—The bridge proposed over the Patuxent River at Avalon will be paid for partly by Howard County and partly by Baltimore County.

BIDDEFORD, ME.—The contract for the lower Main street bridge is let to the Eastern Bridge Co., of Worcester, Mass., at \$15,200. There were four other bids: Berlin Iron Bridge Co., \$15,920; New England Structural Co., \$21,000; King Bridge Co., \$18,000; Boston Bridge Co., \$19,300.

BUFFALO, N. Y.—The plans for the South Buffalo Ry. Co.'s bridge over the Buffalo River provide for a two-span bridge 400 ft. long. (Aug. 3, p. 530.)

CLEVELAND, OHIO.—Bids will be wanted shortly to rebuild the Liberty street viaduct at an estimated cost of \$32,500. H. J. Stanley, City Engineer. George Holmes, City Clerk.

DARTMOUTH, MASS.—We are told that the town of Dartmouth is considering building a bridge over Padanaram River. Address J. M. Allen, Highway Surveyor, South Dartmouth.

DECATUR, ALA.—Reports state that the Southern Ry. will rebuild the bridge over the Tennessee River at Decatur, and that the Secretary of War has approved of plans for a steel drawbridge with an opening of 170 ft. The new structure is estimated to cost \$175,000.

DUNKIRK, N. Y.—The Lake Shore & Michigan Southern has a permit from the city to rebuild the old Bass street bridge.

FREEPOT, ILL.—Reports state that a \$15,000 bridge is contemplated over Pecatonica River.

GALVESTON, TEX.—There is talk of building a double-track steel bridge for use by all railroads entering Galveston.

HADLEY, MASS.—The question of separating the grades at Flaherty's crossing in Hadley is again under consideration.

HAILEY, IDAHO.—Bids are wanted by the County Commissioners, Oct. 20, for a steel bridge over Little Wood River. W. E. Heard, Clerk.

HUNTINGTON, IND.—Bids are wanted, Sept. 22, by the Commissioners of Huntington County for a bridge in Jefferson Township. W. T. Walmsley, County Auditor.

KANSAS CITY, MO.—Local reports state that the Allen avenue viaduct which is to cross the tracks of the Santa Fe, Burlington & Memphis railroads at the junction of Allen avenue and Brooks street, will soon be built. It will be 1,200 ft. long and the estimated cost is \$80,000. The Atchison has agreed to pay part of the cost.

LILLINGTON, N. C.—Bids are wanted, Oct. 1, for a steel bridge over Cape Fear River. Address A. C. Holloway, Register's Clerk, or E. F. Young, Chairman County Board, Dunn, N. C.

MONTREAL, QUE.—Three plans have been prepared for the proposed track elevation on the Grand Trunk between the Bonaventure Station and St. Henri. The first, submitted at a conference last week, calls for the removal of the sheds and building lifts to handle freight, the cost being \$3,250,000. The second plan provides for raising the tracks, gradually grading down towards St. Henri, with bridges over the streets, cost \$2,500,000. The third plan is the elevation of the track to Mountain street, after which grade bridges are to be built at the crossings; cost, \$1,500,000.

NEW YORK, N. Y.—The following are the bids for the proposed bridge over the Harlem River branch of the New York, New Haven & Hartford R. R., at the Bronx and Pelham Parkway, received by the Department of Parks: Cunningham & Kearns, \$66,125; Thillemann & Smith, \$72,889; Thomas Dwyer, \$70,615; John C. Rodgers, Jr., \$57,507.50; William G. Leeson, \$72,100; Bart McDonald, \$69,889; O'Brien & Berigan, \$69,675; John J. McQuade, \$58,592.50; John G. Tait (awarded), \$56,713.

A hearing will be given, Sept. 25, to the Brooklyn & Jamaica Bay Turnpike Co. regarding the plans for its proposed bridges and turnpike over Jamaica Bay.

NORRISTOWN, PA.—The County Commissioners opened the following bids, Sept. 9, for a steel bridge over the Perkiomen River near Schwenksville: Nelson, Buchanan & Co., \$13,000; King Bridge Co., \$12,800; Canton Bridge

Co., \$13,150; F. R. Long Co., \$13,200; Owego Bridge Co., \$13,250; W. H. Gulick, Phoenixville, \$12,490.

PARKERSBURG, W. VA.—Local reports state that the Baltimore & Ohio will rebuild its bridge across the Ohio River at this place.

PHILADELPHIA, PA.—Regarding reports that bids will soon be wanted for the bridge on the line of Thirty-third street over the Pennsylvania and the Philadelphia & Reading, we are informed that the masonry for these bridges has been partly finished, but no appropriation to finish the work has been made by the City Councils.

PITTSBURGH, PA.—Local reports state that bids will probably be asked about Oct. 1 for the new bridge over Wilmet street, Oakland, to Schenley Park. The bridge will have a two-hinged arch central span of about 450 ft., with steel trestle approaches at both ends. Geo. W. Wilson, Director Department of Public Works.

Bids will be wanted shortly by the Pittsburgh, Fort Wayne & Chicago for its new bridge over the Allegheny River at Eleventh street, authorized by the Secretary of War. It will be a double deck structure and cost about \$725,000.

PORT KENNEDY, PA.—The County Commissioners received nine bids, on Sept. 6, for the new bridge to be built over the Schuylkill, to replace a wooden structure. The bids were: North Penn Iron Co., \$28,600; F. R. Long & Co., New York, \$27,100; Groton Bridge & Mfg. Co., N. Y., \$27,200; Canton Bridge Co., \$27,500; Toledo Bridge Co., \$27,400; W. H. Gulick, Phoenixville, \$27,050; King Bridge Co., Cleveland, Ohio, \$27,200; Nelson & Buchanan Co., Chambersburg, \$26,000; Penn Bridge Co., Beaver Falls, \$27,595.

SACRAMENTO, CAL.—The Board of Supervisors opened bids for bridges at Fair Oaks and Georgiana Slough, Sept. 6. The bidders for the Fair Oaks bridge were: James A. McMahon, \$28,500, 192 ft. of trestle, \$7 per ft.; Hyde Construction Co., bridge \$26,900, trestle work \$8 per ft.; Pacific Construction Co., bridge \$24,800, trestle \$1,500, with \$6 per additional ft.; Cotton Bros., bridge \$27,300, trestle per ft. \$7.50; Clark & Henry, bridge \$25,200, trestle \$1,789, with \$12 for each additional foot. For the bridge over Georgiana Slough the bidders were: The Hyde Construction Co., \$22,000; Pacific Construction Co., \$18,623; Cotton Bros., \$19,800; Clark & Henry, \$19,000; Darby Laydon, \$19,000 on published plans, and \$19,475 on special plans prepared by him.

SLATINGTON, PA.—The following bids were received by the Commissioners of Lehigh County for a steel bridge at Main street over Trout Creek: King Bridge Co., Cleveland, Ohio, Plan A \$14,275; B \$14,400, C \$14,605; Penn Bridge Co., Beaver Falls, Plan A \$15,995, B \$17,506; Groton (N. Y.) Bridge Co., G. W. Shoemaker, agent, Plan A \$15,000, B \$14,844; Nelson & Buchanan Co., Chambersburg, Plan A \$14,500, B \$15,760, C \$15,965, D \$17,445; Oswego (N. Y.) Bridge Co., \$23,700. The contract for the superstructure is let to the Penn Bridge Co. at \$15,995, and the masonry to Horn & Neff, of Slatington. The bridge will be 212 ft. long and will have three spans, and will be 42 ft. wide.

SMITHVILLE, VA.—The Charlotte County R. R. will need one steel bridge on the proposed line. B. P. Eggleston, President.

TOLEDO, OHIO.—The Lake Shore & Michigan Southern has let a contract to the Toledo Bridge Co. for a double track through truss bridge 760 ft. long over Maumee River. The foundations will be built by the railroad company. The estimated cost is \$250,000.

TORONTO, ONT.—The City Engineer informs us that the city does not contemplate building a bridge at Dundas street, as recently reported.

The City Engineer has been instructed to prepare plans for a subway 42 ft. wide at the Lansdowne avenue crossing, at an estimated cost of \$60,000.

TRACY, CAL.—The County Surveyor has been ordered to make plans and specifications for the proposed bridge across the San Joaquin River at Dunham's Ferry. The County Clerk will receive bids when the plans are made.

WILMINGTON, DEL.—The War Department has ordered the Levy Court of New Castle County to widen the Market street bridge over Christina River by Sept. 1, 1901.

YAMASKA, QUE.—The plans for the South Shore Ry. bridge over the St. Francis River between St. Francis du Lac and St. Thomas de Pierreville, County of Yamaska, may be seen at the office of the County Register at St. Francis du Lac, at which place bids will soon be wanted.

Other Structures.

CAMDEN, N. J.—Chief Engineer Brown, of the Pennsylvania, will open bids at 9 a. m., Sept. 27, for building the new ferry houses, slips, etc.

FORT MONROE, VA.—Proposals for furnishing and delivering structural steel and iron castings at Fort Monroe will be received at the U. S. Engineer office, 166 Granby street, Norfolk, Va., until Oct. 18.

MINNEAPOLIS, MINN.—Reports state that the Chicago & Northwestern will soon build a new freight station on Poplar street.

NORFOLK, VA.—The contract for building the new coal pier for the Norfolk & Western at Lambert's Point is let to the Sanford & Brooks Co., of Baltimore. The new pier will be of steel, 800 ft. long.

PHILADELPHIA, PA.—The United States Pipe Line Co. has made application to the Board of Port Wardens for permission to build a pier at Marcus Hook for use of vessels loading for Europe. The pier will be entirely in Pennsylvania.

The Philadelphia & Reading has made application to the Board of Port Wardens to build a pier 280 ft. wide, 180 ft. east of pier C, at Port Richmond, to be known as pier D.

The coal shipping station of the Pennsylvania R. R. at Greenwich Point, in the southern part of Philadelphia, is to be enlarged. A fifth large pier is to be built.

WINNIPEG, MAN.—Plans for improving the Winnipeg yards, and for the new shops of the Canadian Pacific, costing between \$150,000 and \$200,000, have been finished and sent to Montreal for approval.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xi.)

Texas Railway Club.

The meeting of the Texas Railway Club, which was to have been held at Galveston, Tex., on Sept. 17 and 18,

was postponed indefinitely because of the recent disaster at that place.

New York Railroad Club.

A meeting of the New York Railroad Club was held at the rooms of the American Society of Mechanical Engineers, 12 West 31st street, New York city, Thursday evening, it being the first meeting of the season 1900 to 1901. The paper of the evening was by Mr. John A. Secor, and entitled: "Some Recent Developments in Internal Combustion Engines."

Pacific Coast Railway Club.

At the meeting of the Pacific Coast Railway Club, in San Francisco, Aug. 18, the paper presented was "Wrecking and Appliances." Mr. F. L. Bates' paper on "Counterbalancing of Locomotives" was taken up for discussion. The paper for the meeting, Sept. 15, is "Water Treatment for Boilers," by Mr. Howard Stillman, Engineer of Tests, Southern Pacific Co.

American Society of Railroad Superintendents.

As we announced, last week, the American Society of Railroad Superintendents will meet in New York, Oct. 18 and 19. We are informed that a large number of members have signified their purpose to be present. Visits will be made to the railroad freight terminals in and around the harbor. Besides the reports of the regular committees it is proposed to discuss division organization, yard records, and revision of the catechism for examining employees.

PERSONAL.

(For other personal mention see Elections and Appointments.)

—Mr. W. L. Hoge, Secretary of the Utah & Pacific, died recently.

—Mr. Charles Graham, formerly Master Mechanic of the Delaware, Lackawanna & Western, died recently at his home in Scranton.

—Mr. John B. Newton, who, on Sept. 8, became General Manager of the Atlanta, Knoxville & Northern, has been Acting General Manager of this company since Sept. 20, 1899, and in April of the same year was Chief Engineer. Mr. Newton was at one time Assistant Engineer of the Southern.

—Mr. P. M. Hammett, Assistant Superintendent of Motive Power on the Boston & Maine, at Boston, was born in 1867. He was graduated from Harvard College in 1888, and from the Massachusetts Institute of Technology in 1890. He began his railroad service with the Pennsylvania as an apprentice in the Altoona shops and remained there until 1893, when he was appointed General Foreman of the Wilmington shops of the Philadelphia, Wilmington & Baltimore. In 1896 he entered the service of his present company, the Boston & Maine, as Division Master Mechanic, and continued in that position until his recent advancement.

ELECTIONS AND APPOINTMENTS.

Albany & Hudson.—Frank M. Smith has been appointed Chief Engineer, with headquarters at Valatie, N. Y.

American-Mexican Pacific.—R. H. G. Minty has been elected Vice-President and Secretary, with headquarters at Tucson, Ariz. (See R. R. Construction column, Aug. 10, p. 545.)

Atlanta, Knoxville & Northern.—John B. Newton, heretofore Acting General Manager, has been appointed General Manager, effective Sept. 8.

Chattanooga Southern.—D. F. Brandon, heretofore Roadmaster, has been appointed Superintendent of Bridges and Buildings at Chattanooga, Tenn.

Chicago & Southwestern of Indiana.—R. W. Bidgood, Auditor at Muncie, Ind., has resigned.

Chicago, Burlington & Quincy.—A. B. Smith has been appointed First Assistant General Freight Agent and F. Montmorency Assistant General Freight Agent.

Chicago, Indianapolis & Louisville.—W. J. Hartman has been appointed Road Foreman of Engines and Air-Brake Instructor, with headquarters at Lafayette, Ind.

Columbus, Sandusky & Hocking.—R. A. Jaynes, Acting General Freight and Passenger Agent, has been appointed General Freight and Passenger Agent.

Delaware, Lackawanna & Western.—Edwin M. Rine has been appointed Acting Superintendent of the Scranton Division, with headquarters at Scranton, Pa.

Great Northern.—J. L. Forepaugh has been appointed Assistant Superintendent of the Northern Division, with headquarters at Grand Forks, N. Dak., succeeding B. F. Egan, promoted, effective Sept. 15.

Illinois Central.—C. A. Strom has been appointed Mechanical Engineer, with headquarters at Chicago, Ill., succeeding E. Grafstrom.

Interoceanic Ry. of Mexico.—J. C. Caskey has been appointed Terminal Superintendent, with headquarters at Vera Cruz, Mex., succeeding F. Adams.

Kansas City, Mexico & Orient.—The following new Directors have been elected: R. H. Law and W. H. Baker.

Long Island.—F. E. Haff, heretofore Assistant Treasurer, has been elected Secretary.

Missouri, Kansas & Texas.—F. N. Finney has been made Superintendent of Construction at Milwaukee, Wis.

Nashville, Chattanooga & St. Louis.—E. F. P'Pool, heretofore Assistant Comptroller, has been appointed Comptroller, succeeding J. D. Maney, resigned on account of ill health.

New Orleans & Northwestern.—N. V. Truly has been appointed Purchasing Agent, with headquarters at Natchez, Miss., succeeding F. W. Main, resigned.

New York, Susquehanna & Western.—M. N. Diefenderfer has been appointed General Foreman, with headquarters at Stroudsburg, Pa.

Philadelphia & Reading.—J. M. Sheetz has been appointed Road Foreman of Engines at Reading, Pa.

Pittsburgh, Binghamton & Eastern.—J. L. Wickes has been appointed Principal Assistant Engineer, with headquarters at Towanda, Pa.

Rio Grande Western.—Joseph T. Schlacks has been appointed Division Master Mechanic, with headquarters at Helper, Utah, succeeding R. English, resigned.

Southern.—N. E. Sprowl has been appointed Master Mechanic, with headquarters at Columbia, S. C., succeeding T. S. Inge, resigned.

Toledo, St. Louis & Western.—A. H. Jones has been appointed Superintendent of Telegraph, succeeding N. McKinnon, who has taken charge of the Purchasing Department under the supervision of the President.

Washington & Columbia River.—C. W. Taylor has been appointed Superintendent, with headquarters at Hunt's Junction, Wash.

Wisconsin Central.—George T. Jarvis, Receiver and General Manager of the Louisville, Evansville & St. Louis Consolidated, has been appointed General Manager of the W. C., effective Sept. 17.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALBERTA RAILWAY & COAL.—Contracts have been let to The Settlers, at Sterling, N. W. T., for 14½ miles, and to Mr. Hamilton, at Lethbridge, for the Pothole section on the extension from Lethbridge, N. W. T., north to connect with mines. The Dominion Parliament has granted a subsidy of \$75,000 for 30 miles. (Construction Supplement, July 27, 1900.)

ARCADIA & CLIFTON HEIGHTS.—The route of this company, incorporated in Pennsylvania, Sept. 7, is from a point near Addingham P. O., in Delaware County, to a point near Clifton station, on the Philadelphia, Wilmington & Baltimore, 2½ miles. The incorporators are: Henry M. Brennan (President), 133 South 11th street, Philadelphia; F. Mortimer Cleveland, Philadelphia; Morley Underhill, Lansdowne; James B. Haines, Philadelphia; Chas. M. Wagner, Lansdowne, and James T. Stewart, Lansdowne.

ATCHISON, TOPEKA & SANTA FE.—The Attorney General of Texas has approved an amendment to the charter of the Gulf, Colorado & Santa Fe for the proposed extension of the Somerville-Conroes branch east from Liberty County to a point on the Sabine River, in Newton County, to connect with the Gulf, Beaumont & Kansas City, recently acquired. (Aug. 10, p. 545.)

BELFAST & NISKY.—This company was incorporated in Pennsylvania, Sept. 4, with a capital stock of \$15,000, to build a line from Belfast, Northampton County, to a point on the Bangor & Portland, near the station at Nisky, 1½ miles. The directors are: John E. Leinbach (President), Eugene P. Unangst and Wm. H. Opp, Bethlehem; Mark T. Swartz, L. C. Williams, John A. Miller and Frank Huth, Nazareth.

BERKELEY.—The Standard Yellow Pine Co., of Monks Corners, S. C., is reported to have leased this line, which extends from Monks Corners to Chiora, 10 miles. The company proposes to rebuild the line and to build about 10 miles of extensions to connect with adjacent timber and mills. D. J. Hauer, of Monks Corners, is Chief Engineer.

BRAINEB & NORTHERN MINNESOTA.—Building is reported begun at Bemidji, Minn., for the Minnesota & International extension north 91 miles to Grand Falls in Itasca County. Halverson & Co., of Minneapolis, have the contract, of which 40 miles is to be completed this year. (Aug. 31, p. 588.)

CHESAPEAKE & OHIO.—The company is reported to have completed five miles of double track between Glade and Prince, W. Va., and has let contracts for double track between Anderson and Halfway, W. Va., four miles, and between Laurel and Big Bend, W. Va., three miles.

CHICAGO & NORTHWESTERN.—Surveys are reported completed for a branch from Pelican Lake, Wis., northeast about 16 miles to Crandon. This is probably under the charter of the Crandon, which was recently incorporated in Wisconsin. (Aug. 24, p. 574.)

CHICAGO & WABASH VALLEY.—The company has filed articles of incorporation for an extension from Gifford, Ind., south about 45 miles through the townships of Barkley, Hanging Grove, Milroy, Princeton, West Point, Round Grove and Wabash to West Lafayette, in Tippecanoe County. The line has been completed from Kersey south through Gifford to Pleasant Grove, and is building to McCosburg. Benj. J. Gifford, of Kankakee, is President. (Construction Supplement, July 27, 1900.)

DAKOTA, NEBRASKA & SOUTHERN.—Contracts will be let next month, according to report, on 160 miles of road from Grand Island to Fort Pierre, S. Dak. The line is projected from Grand Island, Neb., north to Aberdeen, S. Dak., and building is in progress on the section north of Pierre. John H. Bowman is President and Jacob E. Hines, Vice-President, both of Omaha, Neb. (Construction Supplement, July 27, 1900.)

DELAWARE VALLEY & KINGSTON.—The Appellate Division of the New York Supreme Court has handed down a decision endorsing the action of the State Railroad Commission in granting permission to this company to build its proposed line. This is the incorporation of the independent coal companies for a new line along the old Delaware & Hudson Canal bed from Hawley, Pa., east 96 miles to Rondout, N. Y. Wm. V. S. Thorne, 1 Broadway, New York, is President. (May 18, p. 329.)

ELIZABETHTOWN & WESTPORT.—This company was incorporated, in New York, Sept. 18, with a capital stock of \$100,000, to build a railroad from Elizabethtown east 10 miles to Westport, on the Delaware & Hudson. The incorporators are: G. P. Hopkins, M. S. Decker, John Willoughby, of New York; and A. Van Vechten, of Elizabethtown, N. J.

FAIRMONT & CLARKSBURG ELECTRIC.—This company has been incorporated in West Virginia to build an electric line 18 miles long, connecting these two cities. J. N. Camden, of Parkersburg, W. Va., is interested.

FORT SMITH & WESTERN.—Surveys are completed on this line from Fort Smith, Ark., west 175 miles to Guthrie, Okla. T. Congress has granted right of way through the Choctaw and Indian Creek nations. George Hayden, of Ishpeming, Mich., is President, and F. W. Bond, St. Louis, Mo., Chief Engineer. (Construction Supplement, July 27, 1900.)

GERING & SOUTHERN.—This company has been organized at Gering, Neb., to build a line from near Scott's Bluff, on the Guernsey extension of the Chicago, Burlington & Quincy, to run to Gering, three miles. E. W. Fayre is President; Robert F. Neeley, Vice-President; Henry M. Thornton, Secretary; Martin Gering, Treasurer.

GOLD BELT.—Preliminary papers have been filed in Arizona to incorporate this company, with a capital stock of \$75,000, to build from Huron, on the Prescott & Eastern, County of Yavapai, southwest through the Big Bug mining district, and thence over the head of Big Bug Creek and south toward the Bradshaw Mountains to a point near the town of Crowned King, with a branch from Big Bug Creek over into Lynx Creek; also a line from Huron east to the Agua Fria River, and thence northward up that river to Cherry Creek Station, thence east to the Rio Verde and up that river and west toward the town of Jerome, in all about 75 miles. The incorporators are: Frank A. Davies, Maude M. Clifford, C. Milton Robler, W. H. Baldwin and Henry B. Clifford, all of New York city.

GRAND RAPIDS, HOLLAND & LAKE MICHIGAN.—The company has executed a mortgage to the American Trust & Savings Bank of New York for \$1,500,000, for its proposed double track trolley line from Grand Rapids, Mich., southwest 32 miles to Holland. John Winter, of Detroit, Mich., is President. (Construction Supplement, July 27, 1900.)

GRAND TRUNK.—The company has submitted three plans for improving the line from St. Henri to the Bonaventure station in Montreal. The estimated cost is from \$1,500,000 to \$3,250,000. (Construction Supplement, July 27, 1900.) A spur is building at Burk's Falls, Ont., to connect with the docks on the Magnetawan River. The Provincial Government has granted \$7,500 aid.

HARTFORD & HELENA.—This company has been organized in Idaho, to build a railroad along the Idaho side of the Snake River from Olds Ferry (Hartford) north about 125 miles through the Seven Devils District to the mouth of the Salmon River. W. Thomas Hart, of Weiser, Idaho, President of the Idaho Northern, is the President. The Idaho Northern is building along the Coeur d'Alene River, Idaho, to Murray. (I. N., Construction Supplement, July 27, 1900.)

JACKSON, COLUMBUS & NORTHEASTERN.—The Governor, on Sept. 17, approved the charter of this company to build from Jackson northeast 150 miles up the Pearl River, and on to Columbus, with a further extension to the Alabama coal fields.

KANSAS CITY, FORT SCOTT & MEMPHIS.—Preparations are being made, according to report, to build an extension from Miami, Ind. T., southwest through Indian Territory and Oklahoma.

LAKE ERIE & WESTERN.—The company is reported to have ordered 2,500 tons of 75-lb. rails from the Illinois Steel Co.

LOUISVILLE & NASHVILLE.—The company is reported to have accepted the ordinance of the New Orleans Municipal Council providing for a passenger station and 5½ miles of additional trackage.

MINNEAPOLIS & ST. LOUIS.—Surveys are in progress south of Angus, on the Chicago, Rock Island & Pacific, for an extension southwest. It is understood that the objective point is Kansas City.

MOBILE, JACKSON & KANSAS CITY.—The company is reported to have decided to extend its line from Merrill City, Miss., northwest toward Jackson as far as Hattiesburg, where connection will be made with the Gulf & Ship Island into Jackson. (July 13, p. 488.)

MOUNTAIN VALLEY.—This company has been incorporated in California to build a line from Bakersfield, on the Southern Pacific and the Atchison, to run northeast about 25 miles up Kern River to Weldon.

NASHVILLE & KNOXVILLE.—King Bros., of Monterey, Tenn., have the contract for building the branch from Monterey, northeast about 16 miles, to Hanging Limb. (Sept. 7, p. 602.) Building is in progress. (Official.)

PAWPAW.—This company has been incorporated in West Virginia, to build a railroad from Fairmont, on the Baltimore & Ohio, to run north about 15 miles to Fairview. The incorporators are: U. N. Arnett, ex-Gov. A. B. Fleming, Z. G. Morgan, Judge John W. Mason and Judge W. S. Haymond, all of Fairmont.

PENNSYLVANIA.—Notice has been given to the former owners of property in Railroad Place, Newark, N. J., to vacate the property. This is understood to be preliminary to the elevating of the tracks in that city. (Construction Supplement, July 27, 1900.)

PITTSBURGH & LAKE ERIE.—Wm. K. Vanderbilt is reported as announcing that this line is to be extended from Fayette City, Pa., south into the West Virginia coal fields.

REPUBLIC & KETTLE RIVER.—This company has been incorporated in Washington, with a capital stock of \$1,000,000, to build a railroad from Nelson, B. C., southwest to Republic, Wash. Surveys are to be begun at once. The first board of trustees is as follows: Clarence McCuaig, of Montreal; Warner Miller, New York; John C. Ralston, Spokane; Albert A. Ayer, Montreal; R. G. Edwards Leckie, D. F. Hallahan and A. F. Burleigh.

RIO GRANDE WESTERN.—Deal Bros. & Mendenhall, Springville, Utah, have the contract for straightening curves and changing grades near Soldier Summit, Utah. Work is reported begun.

ROCKLAND COUNTY TRACTION.—This company has been incorporated in New York, with a capital stock of \$300,000, to build a railroad, probably electric, 30 miles long, entirely within Rockland County. C. W. Reeves, of Brooklyn, N. Y., is interested.

SAN FRANCISCO & CLEAR LAKE.—The route of this proposed line is from Vallejo, Cal., north 86 miles via Napa, Toke and Loconoma Valley to Lower Lake, on Clear Lake, with steamer connection to Lakeport and across San Francisco Bay to San Francisco. Not less than 12 quicksilver mines will be tributary to this line. W. B. King, 418 California street, San Francisco, is interested. (Sept. 7, p. 602.)

SHREVEPORT & RED RIVER VALLEY.—Opplé & Hayes have the contract for 15 miles from Bayou Darro to Alexandria, La., and have begun work. The same company has the contract from Alexandria to South Mansura, 31 miles. Building is in progress from St. Maurice southeast 32 miles via Colfax to Bayou Darro. (Construction Supplement, July 27, 1900.)

SOUTHERN PACIFIC.—An officer writes that surveys are being made at various points on the Central Pacific, with a view to possible improvement of alignment or grade. The survey near Wells, Nev., recently referred to, is in line with this policy. (Sept. 7, p. 602.)

TOLEDO TERMINAL.—This company has been incorporated, with a capital stock of \$5,000,000, to build a double track line, about 30 miles long, around the city of Toledo. Among the incorporators are Thomas S. Tracy, Chas. F. Chapman, Jr., Wm. B. Duck, and James A. Murphy.

TRENTON, LAWRENCEVILLE & PRINCETON.—New articles of incorporation were filed in New Jersey, Sept. 13, for the Princeton end of this line under the Trenton, Lawrenceville & Princeton extension. (June 15, p. 408.)

WASHINGTON ROADS.—The Potlatch Commercial & Terminal Co., at Hoodsport, proposes to build a logging road into timber back of that city.

WINNSBORO & CAMDEN.—Surveys are in progress for this line from Camden, S. C., west 32 miles, via Ridgeway, to Winnsboro, on the Southern. T. K. Elliott, of Winnsboro, is President. (Construction Supplement, July 27, 1900.)

YORKTOWN, POQUOSON & HAMPTON.—A director is reported as saying that arrangements will be completed this fall to begin work on this line from Yorktown southeast about 24 miles to Hampton. Sidney Smith, of Williamsburg, Va., and Major J. F. Hubbard, of Yorktown, are incorporators. (Construction Supplement, July 27, 1900.)

GENERAL RAILROAD NEWS.

ATLANTA & WEST POINT.—At the annual meeting, on Sept. 12, it was voted to procure the necessary amendments to the charter enabling the company to buy, lease or obtain running rights on the Atlanta Belt Line. (Sept. 22, 1899, p. 668.)

CALIFORNIA NORTHWESTERN.—The company has increased its bonded indebtedness to \$2,000,000, to cover its proposed extension from Ukiah, Cal., northwest 60 miles up the coast. (Railroad News, Sept. 14, p. 614.)

CHICAGO & GRAND TRUNK.—Judge Swan, in the U. S. Circuit Court, at Detroit, has entered a decree of foreclosure of this property, now in the hands of the receivers. (July 13, p. 488.)

FITCHBURG.—The stockholders at Boston, Sept. 14, ratified the lease of their property to the Boston & Maine by a vote of 95,623 shares to 227 shares. (Aug. 24, p. 574.)

ILLINOIS CENTRAL.—At the annual meeting, Sept. 26, the stockholders will vote on the question of buying the section of the St. Louis, Peoria & Northern from Springfield, Ill., to East St. Louis, and of issuing thereon 3 per cent. mortgage gold bonds, payable in 1951, to an amount not to exceed \$4,000,000.

ILWACO RAILWAY & NAVIGATION.—The Oregon Railroad & Navigation has not assumed control of this property. (Aug. 31, p. 588.) It has been bought, however, by parties who are friendly to the O. R. & N. No change in officers is contemplated. (Official.)

KANSAS CITY SOUTHERN.—Judge W. J. Bryant, of the U. S. Circuit Court at Louisiana, has appointed C. J. Glass, of Texarkana, receiver of the terminal properties at Port Arthur, Tex., belonging to the Port Arthur Channel & Dock Co.

MANILA & DAGUPAN.—Attorney General Griggs has issued an opinion that the U. S. Government is not bound by the Spanish contract to pay the subsidies granted by Spain to that company. (May 25, p. 348.)

NASHVILLE, CHATTANOOGA & ST. LOUIS.—The stockholders, at Nashville, Tenn., on Sept. 12, ratified the lease of the Memphis & Paducah division to run for 99 years from Dec. 14, 1895. This division comprises 253.74 miles of road extending from Memphis, Tenn., to Paducah, Ky., 229.59 miles, with a branch from Perryville to Lexington, Tenn., 24.15 miles. It was bought in 1895 by the Louisville & Nashville, and its operation assigned to the N., C. & St. L. on Jan. 1, 1896.

PANAMA.—Six per cent. subsidy bonds to the par value of \$136,000 have been drawn for payment at the company's office, New York, at par, on Nov. 1. (Sept. 14, p. 614.)

PEORIA, DECATUR & EVANSVILLE.—The receiver is reported to have sold the New Harmony branch from Stewartsville, Ind., to New Harmony, 6.29 miles, to the Illinois Central for \$59,000, subject to the mortgage.

ST. PAUL & DULUTH.—The Minnesota State Railroad & Warehouse Commission, after a conference with the officers of the Northern Pacific, has withdrawn all legal objections to the operation of the St. P. & D. by the N. P. (July 20, p. 502.)

SEABOARD AIR LINE.—The company has bought 2,000 freight cars through Blair & Co., New York, at a cost of \$1,354,000. A cash payment of 15 per cent. is made and for the balance the company issues its 5 per cent. equipment notes, payable in \$50,000 quarterly installments.

TOLEDO, PEORIA & WESTERN.—According to the thirteenth annual report, just received, the gross earnings for the year ended June 30, 1900, were \$1,077,904, an increase of \$101,247 over the gross earnings of last year; the net earnings were \$227,779, a gain of only \$3,365 over the net of a year ago; that is, operating expenses have increased nearly to the full extent of the increase of earnings. This increase in operating expenses is due, in part, to the increase in conducting transportation incident to the larger volume of business, and to the increased cost of fuel and other material used. The remainder represents the increased expenditure for equipment, and for labor and material put into the track. The company has expended \$56,670 this year for renewal of ties, against only \$33,831 a year ago. There were bought during the year 300 box cars, 26 stock cars and 50 coal cars, costing \$216,586, to be paid in ten annual payments. Of this amount \$28,307 has been paid and charged to operating expenses during the year.

TOLEDO, ST. LOUIS & KANSAS CITY.—The third installment of \$5 on the preferred stock, and \$3 on the common stock is called for payment at the Central Trust Co., New York, Sept. 25. (Aug. 31, p. 588.)

WAYCROSS AIR LINE.—The company has made a mortgage to the Farmers' Loan & Trust Co., New York, as trustee, to secure \$1,400,000 20-year first mortgage 5 per cent. gold bonds, due July 1, 1920. These include \$150,000 bonds which have a prior lien in the payment of both the principal and interest. The company reserves the right to call these prior lien bonds after five years at 110 and interest, and to issue a like amount of the new bonds. Of the new bonds \$350,000 has been issued and the remainder may be issued at the rate of \$5,000 per mile above 70 miles. The company is building an extension from Ashley, Ga., to Fitzgerald, 23 miles. (Railroad Construction, April 24, p. 574.)

WESTERN NEW YORK & PENNSYLVANIA.—The stockholders, on Sept. 13, ratified the lease of the property to the Pennsylvania. (Aug. 24, p. 574.)